# ARCHIVES

## OF

# USEFUL KNOWLEDGE.

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## PAPERS ON COMMERCE.

### DESCRIPTION OF A SUBMARINE THERMOMETER,

*Invented by Benjamin Connor, of Portsmouth, New Hampshire.*

With a plate.

Communicated by the Inventor.

THIS machine consists of a hollow box, of a rectangular or other shape, of sufficient dimensions to admit a thermometer, and to hold a pint of water. On one side of this box is a plate of glass of sufficient thickness to bear the external pressure of the water, while the box is descending. Through this glass the height of the mercury in the thermometer may be easily seen.

From the bottom, a cylindrical shaped box projects of less diameter than the case of the machine, and having a hole or holes to admit the water.

Through the centre of the machine runs a circular rod of brass or copper, having a shoulder near the bottom, on which rests a plate of leather: round the part of the rod below this shoulder, a spiral spring is wound which rests upon the bottom of the box, to this spring a brake lever is attached, having a wire fastened to the end of it, and extending the length of the box; from thence

proceeds a line called a messenger. The glass in front of the thermometer is covered by a guard of metal screwed to the solid part of the box above, so as to permit it to traverse freely. A small hole is made in the top of the box.

When the box is used, it is let down by a cord passing through the top of it, into the water to the required depth: the cord is then slackened, and the weight of the box is supported by the messenger line, thus raising the lever below and admitting the water into the box: then letting go the messenger, and hauling up the box by the main cord, the rod is pulled down, the apertures are stopped, and the water prevented from escaping. The temperature of the water may then be examined.

References to the plate. See plate 1, figure 1.

A. The box containing the thermometer.
B. The brake lever, with the wire attached.
C. The messenger line.
D. The cover over the glass.
E. The main line.

REMARKS.

Captain Peter Bell, of Philadelphia, used the submarine thermometer during the months of September and October, 1810, on a voyage from Philadelphia to Liverpool; and again in January and February, 1811, on his return to the United States, in the ship Anna Maria: and although he made but two observations daily, viz. one in the morning, and another in the afternoon, yet he could accurately predict, by the great diminution of the temperature of the water, when he approached the Banks of Newfoundland, or got into soundings, and the lead never failed to prove the fact. He concludes his Journal by approving highly of the principle, and of the excellence of captain Connor's invention. The reader is referred to Archives, Vol. I, p. 255, for the particulars of another Journal, with the remarks of colonel Williams.

The temperature of the water should be tried several times daily.

Mr. Connor's invention is patented, and will be shortly for sale in Philadelphia, and other sea-port towns.

## ON THE CAUSES OF THE DECAY OF THE TIMBER IN SHIPS, AND THE MEANS OF PREVENTING IT.*

In a letter from a correspondent.

THE advantages that England derives from her marine, whether considered as appertaining to commerce or defence, are too well known to need any comment; whatever then will contribute either to the safety or durability of the navy, becomes a matter of great public importance.

The grand cause of the decay of the timber employed in building of ships, is the decomposition of its substance by putrefaction, which is occasioned by moisture. This, precaution and management may retard, but not prevent; but a secondary one, the dry rot, may, I think, be both prevented and eradicated.

The dry rot, as it is usually called, proceeds from the growth of a parasitical plant, named by botanists *boletus lachrymans*, which belongs to the class of cryptogamia. Its injurious tendency is mentioned as far back as history will carry us, and the appearance and ravages are particularly pointed out in the Bible.† The cure there directed is, to remove the materials injured; and, if this did not stop the disease, the house was razed, and the entire articles of which it was composed taken without the city. In latter times an equally effectual but more easy remedy has been applied in buildings, where this plant has taken root; that of causing a circulation of air in the parts affected; but this cannot be introduced in the fabrics of which we are now treating.

Several means have been tried to prevent its vegetating, many of which might have answered this purpose, had they not been found to introduce evils as great as that which they pretended to cure. Among the most prominent, was the mode practised on the timbers of many ships, between the years 1768 and 1773, by saturating them with common salt; but this was found to cause a rapid corrosion in the iron fastenings, and the ships were (be-

* Nicholson's Philosophical Journal, vol. 30, p. 287. London, 1812.

† Leviticus, Chap. 14.

tween decks) in a continual state of damp vapour.(a) Mundic, found in the mines in Devonshire, has been lately employed, in fusion, to eradicate the vegetation, and prevent its future growth; but time is required to prove its efficacy.

In the common mode of constructing ships, there are several causes, which promote the growth of fungi. The accumulation and consequent fermentation of materials not sufficiently seasoned, divested too of a free circulation of air, and permitting sap to remain on the edges of the frames, generate carbonic acid gas to the prejudice of the timber, and which promotes the growth of this boletus. Mr. Humboldt has found by experiments, that eight or ten hundredths of carbonic acid gas, added to the air of the atmosphere, rendered it extremely fit for vegetation; and that the air in mines, and other subterraneous passages, was found in this state, which is very favourable to the germination of all plants of the class cryptogamia. The gas found in the openings between the timbers of ships affected with the dry rot has been proved, to be precisely what Mr. Humboldt has mentioned.

The means that I propose to prevent or cure this evil, are twofold: charring the whole surfaces of the timbers, and the inner surfaces of the planks, of which the ships are composed; and causing some slight deviations to be made in the modes practised in building them. I do not pretend to originality, when I recommend charring of timber, either to add to its durability, or prevent the growth of parasitical plants; for the experience of ages has proved the incorruptibility of charcoal, whether buried in the earth, or exposed to the action of air or water. The beams of the theatre of Herculaneum, which were reduced to this state by lava, were found, after a period of nearly eighteen centuries, to be perfect. The piles, supposed to have been driven into the earth by order of Julius Cæsar, when he forded the Thames at Cowey Stakes, near Shepperton, were charred, and, when recently taken up, found in a complete state, free from decay! Among many other instances, that may be adduced, the practice of burning the ends of posts to be put into the ground, to pre-

vent premature dissolution, may be added as an additional proof of the efficacy of this recommendation; and makes us lament, that it has not been generally introduced in fabrics, where so much timber, labour, and money, have been expended; and the hopes and expectations of government or individuals frequently disappointed, by their rapid decay.

There are several other advantages, that will be obtained by burning the surfaces of timber. Rats, which are so destructive to ships, will not touch charcoal; nor will the white ants and cockroaches, so common in the Indies, commit their depredations on substances so prepared. If farther evidence of its utility, when employed only on a small scale, be necessary, the durability of the Royal William, the flag ship at Spithead, which was built in the year 1719, and the planks *only* were burned on their inner surfaces, would be sufficient to prove its efficacy when practised on ships. Of late years the ends of ships' beams have been charred, and the sound state in which they are now found has justified and established the practice. Indeed all substances, that have undergone the action of fire, have been proved to be unfavourable to the growth of the boletus lachrymans; for, while stone has been rapidly destroyed by it, well burnt bricks, in the same buildings, and in nearly the same situation, have been free from its attacks.

The scarcity of English oak, occasioned partly by the improved state of agriculture, but more by the increased numbers of our fleet, has obliged this country to have recourse to wood grown in other states. The principal that have been introduced in aid of oak are the varieties of American pine: it becomes, therefore, of some importance to inquire, which sort of this timber is the most durable, and which the soonest destroyed by vegetation. Pitch pine has been used by all nations in the construction of ships, and appears to be very superior to every other species for general durability; but this wood is the soonest destroyed by fungi, as these plants are nourished by the great quantity of resin contained in its numerous cells. I have lately seen some pitch pine plank of 7 inches in thickness completely de-

composed; and, when cut open, the boletus was found to be vegetating in every part of it, but principally in the cells which were originally filled with resin. This proves how improper it will be to employ it as treenail fastenings, on which the strength and safety of ships so much depend. *(b)* Pitch pine should not be covered with paint, as the pores of the wood are thereby stopped, and the expansion of the resin prevented, by which means the ligneous cells are broken, and decomposition takes place. The Americans pay the topsides of their ships with a mixture of oil, resin, &c., which are not unlike the substances that are contained in the wood they cover, and produce a hard varnish, impervious to water. Perhaps the preparation recommended by doctor Parry,* to prevent the dry rot, given in the Transactions of the Bath and West of England Societies, might be introduced also for this purpose with success. White wash or lime water to be used between decks is much to be preferred to paint, both on account of its cheapness and cleansing qualities, and also as it is detrimental to vegetation.

Instead of the frames of a ship being converted to their proper shape for some months before they are put up, and afterward standing on a slip a year to season, as is now the usual practice; I would recommend, that they should be converted, and remain, together with the planks, in that state (under cover where there shall be a free circulation of air) for two years, then charred, put up, and the planking immediately begun; commencing operations from within board, by which means chips and dirt will not accumulate between the timbers; *(c)* care being taken, that the holes be not bored too near the seams in the outboard plank. Holes should be bored, but no treenails driven till within a short time of the ship's being launched; this will both convey air within board, and carry off the vegetable juices, if any remain in the interior of the timbers. The planks could be kept in their places

* It is made as follows: take 12 ounces of resin, 8 of roll brimstone, 3 gallons of oil, and 4 ounces of bees wax: boil them together, and lay them on while hot. [See Archives, vol. I, p. 334. *Editor.*]

by the usual butt bolts, and some copper nails, or small bolts ragged, being driven at intermediate spaces. This too would strengthen the ship, as metallic fastenings are always to be preferred, in the wales and bottom, to treenails.

An objection may be made to the bringing round thick planks in the bow of a ship by burning, rather than the usual practice of boiling them in a kiln, on account of breaking their fibres. Although I do not see, that any difficulty can exist in the former method, as it is the usual practice of the French; yet, if any should occur on trial, and boiling them be considered absolutely necessary, vegetation may be prevented by dissolving some green vitriol in the water, and afterward fixing it in the wood by a weak alkali. The method approved of by many judicious shipwrights, and constantly practised by the Dutch, that of sawing the thick planks, that are to be much bent, into two parts, might also be employed for this purpose. If a doubt should exist of the efficacy of wood prepared in these several ways to prevent the dry rot, specimens might be placed in a ship almost destroyed thereby, such a one as I recollect to have seen at Woolwich about 13 years since, which was in so bad a state, that the decks sunk with a man's weight, and the orange and brown coloured fungi were hanging in the shape of inverted cones from deck to deck. A few months trial of wood put into a ship so infected would prove the efficacy of either mode of preparation.

Drying of timber in an oven, as recommended by Fourcroy, is also likely to add considerably to its durability.

One farther precaution is necessary. After a ship is built, she should lie at least six months in ordinary, with her hatchways covered to prevent the admission of rain water; some planks should be removed in the ceiling, and above the waterways of the several decks; and fires constantly kept in stoves, placed in the hold, and on the decks; by which means the moisture, that the charcoal may have attracted, will be dissipated, and the durability of the fabric insured.

Having stated these general circumstances with a view to prevent evils, which yearly exist to a great extent in the navy; I

trust it will be the means of calling forth the opinions and abilities of those, whose minds have been directed, or whose occupations may lead them, to a consideration of this important subject.

I am, &c. &c.

11th November, 1811. NAUTICUS.

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NOTES BY THE EDITOR.

*(a)* The experiment of pickling ship timbers, by immersing them in brine, was tried, with very injurious effects in the frigate United States, built in 1797, in Philadelphia: their decay being rapid and extensive in about one year or a little more after she was launched.* She has been repeatedly repaired since. Other causes may have contributed, such as the closeness of the timbers, and the plan adopted of driving down pieces of pine between them, by which all circulation of air was completely prevented.

*(b)* There is another reason why neither pine treenails, nor pine on any occasion should come in contact with oak; and this is, the destruction of the pine by the acid of the oak. This important fact was discovered by colonel A. Anderson, of Philadelphia, by using pine and oak in the large worm tubs of his distillery, and communicated to the editor many years since; the same effect was perceived, and from the same cause, in the great wooden boiler at the Centre-Square Steam Engine House, Philadelphia.†

This boiler was made of white pine, four inches thick, and oak timber used to support the sides, bottom, and top of it. In

* Filling the spaces between the timbers with salt, has the opposite effect, of preserving them, however unseasoned when put in: and since the publication of the last No. of the Archives, in which the practice was recommended, several instances in addition to those therein stated, have been mentioned to the Editor, of vessels belonging to Philadelphia, which were thus salted, and that have lasted from 20 to 30 years.

† Mr. Latrobe, on Steam Engines. Transactions American Philosophical Society, vol. 6, p. 94.

less than a year it was discovered that the substance of the pine plank, to the depth of an inch was entirely destroyed.

In Philadelphia, the *treenails* used are almost invariably made of the white flowering locust, (*Robinia pseudo-acacia*). This valuable tree should be prohibited from *wanton destruction*, by a law in every state in the union.

*(c)* The operation of "*chipping*" is of great importance in preventing the decay of a ship, and is too often neglected by the carpenters either from carelessness or design. It means, to clear out all the chips made on board, and that fall to the bottom of the vessel. This duty ought to be attended to and faithfully performed before the vessel is ceiled, for the chips by being permitted to remain, generate moisture, foul air, and mould, and decay in consequence will ensue. The correctness of these remarks must be obvious to all who know any thing of shipping, but their weight will probably be increased, by its being known that they come from one of the most experienced ship-masters in the port of Philadelphia.

## INSTRUCTIONS FOR TRAVELLERS.*

IF you travel by the stage coach you should engage your place some days before your departure, to prevent being disappointed, and thereby deceiving your distant friends whom you may have informed by post, when and where to expect you.

In chusing your seat, ascertain in winter on which side the wind is, and in summer, which side will have most of the sun during the day, that you may regulate your place accordingly.

If you travel on horseback, and intend a long journey, you should give your horse fresh shoes. If you hire a hack, do not chuse one for handsome appearance, but examine attentively whether his sides have been much galled by spurs, in which case you may be sure he is a slow stubborn beast, and will occasion

* Translated for the Tradesman, London, May 1809, from a foreign work.

great fatigue and trouble to his rider. Observe also, in what state are his knees, as these will be a sure presentiment if he is sure footed or not.

The next precaution our author gives, is respecting the saddle, advising every traveller to have his own; as much depending on an easy saddle for accomplishing a long journey, as on the goodness of the horse.

He recommends the following method of keeping yourself warm, if travelling in a stage coach during severe nights: besides having the feet in straw, burn a wax taper, and it will be soon found to have rendered the coach as warm as a small room with a fire therein.* Persons travelling on horseback are recommended to use very light food, particularly when riding after dinner, and that the principal meal should be made at supper.

Another salutary precaution recommended to travellers, is always to burn a light in the chamber of the inn where you put up at, and as lamps are not always attainable, the following method is recommended, for substituting a piece of candle, so as to cause it to burn three times as slow as usual; whilst your candle is alight, form around the wick with the point of your knife, a line of fine salt resting upon the tallow, and the point finishing at the flame, this will cause it to burn very slow, and the salt will descend gradually as the tallow is consumed.

After returning from a journey, to take off the tawney complexion from the face or hands created by the weather and sun beams, washing in cold spring water with a diffusion of vinegar, is recommended every morning, as an infallible and speedy remedy.

It is much to be regretted that some few among the many persons travelling for business, from years end to years end, through the greater part of Europe, have not been induced to add some-

* The Editor was lately informed by a gentleman that he burnt two wax candles in his carriage, when travelling in Russia, and found that he was thereby kept very comfortable. The carriage was much closer than common, and he was also enveloped in furr, but notwithstanding these precautions he had previously suffered much from the cold.

thing towards the *useful* and *agreeable*, of their countrymen who stay at home; there is not a place, however insignificant to the passing stranger, but what will have some object or circumstance connected with its local history, worthy of being observed and recorded; the manufactures of the various districts alone would present a wide field for display, not only for the object of curiosity, but improvement perhaps of similar branches at home, where the working manufacturer has not time or opportunity of travelling for instruction.*

No travellers are better versed than the English in the different branches of trade and commerce to which they belong, but beyond that, they have no conception of enquiring. A commercial traveller has many advantages in his favour for an introduction to persons and things, that even the independent gentleman travelling with letters of recommendation in his pocket has not. The traveller will see every thing with the face of nature, but the gentleman through introduction will only be shewn the brightest figures. In visiting manufactures the traveller will be enabled to observe, and record in a more scientific and accurate way than the visitor, retaining only a part of such description as they are pleased to relate to him: and trade and business have such connections, that they will get free access when every other traveller would be denied.

## ADDITIONAL RULES, BY THE EDITOR.

IN travelling in a post chaise in France, the carriage should be the property of the traveller, and ought to be carefully examined before setting out, in order to insure its strength; for the common hacks are worthless vehicles, and very unsafe. Horses are to be procured at every stage agreeably to a law.

It may be well, nevertheless, to provide a hammer, some strong nails, a jack knife, and several yards of bed cord, in case of breaking down, to enable you to mend a broken spring or shaft, without being obliged to call in the assistance of the country people,

* This hint will apply with much force to the numerous Americans who annually scamper over Europe. *Editor.*

who will infallibly take advantage of the traveller, and charge most enormously for services, for which imposition no redress can be had.

The traveller should endeavour to regulate his stages so, as to enable him to reach that at which he intends to stop all night, before, or about sun down, especially if the weather be bad or unfavourable: and previously to unharnessing, or taking off the baggage, he should enter the inn, and make his contract with the landlord for his accommodation, otherwise he will, in all probability be grossly imposed upon. If the demand be exorbitant, the traveller may proceed to the next stage, or if the weather be fine, and the country not interesting, he may go on still further.

When about to enter a new government, or new country, it will be of great importance to take that kind of coin which passes there. Therefore procure it previously to setting off, taking care to avoid false coin, or light gold.

The reader is referred to *count Berchtold's essay* to *direct the enquiries of Patriotic Travellers*, and to *M. Starke's letters from Spain*, for further hints.

## ON SEA VOYAGES.

THE following directions for those who are about to undertake a sea voyage will be found useful to young travellers. Although in direct reference to a passage from England to America, their application is extensive. They are taken from "Cooper's information respecting America. London, 1795."

A SPRING passage will be cold, and therefore the best bedding is a feather bed cut in halves, which supplies two births—In summer, a mattress so treated will be pleasanter than a feather-bed. In spring, provide yourself with a cloth jacket and trowsers; in summer you should have two or three nankeen or other light jackets, and three or four pair of cotton or linen trowsers. A black cravat will be full as convenient on board ship, as a white one.

You should calculate upon a passage of ten weeks from London (which is usually a week longer than from the western ports

of Great Britain) and although you will most probably not be above seven or eight weeks from port to port, it will save you some trouble if you pack up your linen before hand, upon this calculation, for you will have changes ready, without the necessity of opening your boxes immediately.

Let your linen be put up in weekly parcels; for instance, two or three shirts, or two or three pair of stockings, two or three handkerchiefs, and a towel or two. Of these parcels make ten, and you will find it readier, than running to your trunk every time you want to dress yourself.

Take care that the captain has a filtering stone, or some other machine for the same purpose, for the use of the cabin passengers. Should your water, notwithstanding, smell somewhat offensively, which in summer time it will do, this may be remedied by some powder of Charcoal. If there is no filtering stone, the mere particles of dirt will be easily thrown down and the water cleared, by putting about a tea-spoonful of a solution of alum into a pint of water, which in a quarter of an hour will be very clear, and its wholesomeness not in the slightest degree impaired.

Take care to provide yourself with lemons, apples, or any other fruit that will keep; you will find them very grateful, especially after sea sickness. This latter complaint is not dangerous, and is better submitted to than prevented. It goes off earlier by *exercise upon deck in the open air than by staying below in the cabin;* and it is better cured by gentle dilution, than by loading your stomach with food, or by any preventive or curative medicines. On landing, your health will be better for having been sick at sea. This is, at least, as true with respect to females, as the male sex, generally speaking.

Sickness and want of exercise are apt to induce costiveness: this should be guarded against by the laxative medicines you are accustomed to use. This tendency is increased by much animal food and porter, and even the usual quantity of wine. Englishmen are too apt to live in hot weather and southern climates, as they do in the cold and rainy winters of their own country.

A sea voyage is very tiresome. Take, therefore, books, and cards, and chess, and draughts, if you play at those games.

With respect to the articles worth taking with you for your own use in America, I think the best general rule is to take whatever you can pack up in a box, or a chest, keeping an account of the contents. You may take even your glasses and your crockery. Stock yourself with linen, but you need not over stock yourself with other wearing apparel. Carry enough, however, for a twelvemonth at least.

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The following observations and hints on sea voyages, are abridged from a paper by Dr. Franklin.

"It is not always in ones power to chuse a captain, though a part of the pleasure and happiness of the passage depends upon the choice. If he is a social sensible man, obliging, and of a good disposition, you will be much the happier. However if yours is not of this number, if he be a good seaman, attentive, careful and active in the management of his vessel, you may dispense with the rest.

"It is always proper to have some private store, which you may make use of occasionally. Provide good water, and put it in bottles. Carry good tea, ground coffee,* chocolate, wine, cyder, raisins, almonds, sugar, capillaire, citrons, rum, eggs dipped in oil, portable soup,† *bread twice baked.* Dr. F. most humanely adds, that if not wanted, they may be disposed of among the steerage passengers who may be sick, melancholy or dejected.

"Cyder is the best liquor to quench the thirst arising from eating salt beef."

* This should be very closely packed in tin cannisters, in order to preserve its flavour. *Editor.*

† See p. 220.

## ON SEA SICKNESS.

THE editor has had many opportunities to confirm the fact stated by Mr. Cooper, of the improvement in the health of persons, who have been very sea sick. A thorough evacuation of the stomach and bowels ought therefore to be encouraged; but in persons disposed to sea sickness, the stomach may take on a diseased action and cause great distress and emaciation. Remedies should therefore be tried, and the following are recommended.

Cold chamomile tea, taken in small quantities at a time, and frequently repeated. Preserved ginger, or ginger or cinnamon tea, occasionally taken, will prove very grateful. The diet should be cordial and nourishing. In a rough passage along the coast of the United States of several days, the editor suffered severely from the complaint; and after its violence had somewhat abated, a tea spoonful of fine old brandy, mixed with a wine glass full of water and sipped occasionally, proved highly refreshing and salutary. Ratifia taken in small doses, also contributed to his recovery. Split rusks dried are more relished by those who are sea sick than any other kind of bread: and when soaked in claret and water, or port wine, on which a little nutmeg has been grated, will be found very reviving. Preserved cranberries ought to form a large portion of the ship stores of every one leaving America, who consults his comfort in a voyage, nothing being more agreeable as an article of diet sick or well.

A writer in the Monthly Magazine of London, vol. 6. p. 2. advises persons subject to sea sickness,

"1. To take exercise at the pumps.

2. Keep much on deck.

3. Not to watch the motion of the waves.

4. Seek opportunities of mirth.

5. To drink occasionally of liquors containing fixed air, as wine mixed with Seltzer water and sugar, spruce beer, champagne, froth of porter." To these may be added, fine cyder, (in a glass of which a few grains of potash should be dissolved); and drank in a state of effervescence. Artificial soda waters, preserv-

ed in stone bottles, which may now be had in most American sea port towns, would be an excellent drink to restore the tone of the stomach.

"6. To use dulcified elixir of vitriol in water dropped upon loaf sugar, or in peppermint water, or ten drops of sulphuric ether.*

7. Spare diet, bread and fresh meat, eaten cold with pepper, avoiding sweet savoury food and fat: drink little and often.

8. *Keep the bowels open.* If the sickness does not cause an evacuation of the bowels, and the stomach rejects medicine, clysters should be injected daily, composed of a pint of warm water, a spoonful of common salt, two do. of sweet oil, and two do. of molasses or of coarse brown sugar. This remedy promises much relief, by counteracting the costive habit which a sea voyage has a tendency to produce.

9. Apply to the pit of the stomach, a tonic and anodyne plaster.

10. Compress the stomach by tying a bandage round the body.

11. Keep warm and promote perspiration."

Another authority† adds, "the first and greatest of all preventives of sea sicknesss, is the acquiring the habit of walking and standing upright without reeling to and fro, for it is my opinion, and I speak from experience in my own person, that the continual reeling motion of the body is the real cause of sea sickness."

* Care must be taken to avoid approaching to a candle nearer than three feet with the ether. *Editor.*

† Monthly Mag. vol. 7.

## METHODS FOR SAVING LIFE, IN CASE OF SHIPWRECK, OR OVERSETTING OF VESSELS OR BOATS.

By Mr. G. Cumberland.*

ABOUT six years past, a solitary inhabitant of a promontory projecting into the Severn Sea, called Weston Super Mare, I amused myself much among the rocks there, and spent many hours studying the action and form of water when impelled in the figure of a wave; it being my opinion at that time, as it still is that the forms water takes from motion are so determined, that even in sculpture they may be represented with correctness; and that nothing would better teach us the art of representing motion by fixed lines, than these images so often repeated with exactness. On these occasions I frequently observed extensive masses of the sea weed called tang on that coast, and which the farmers burn for manure, floating into the hollow coves below me, on the surface of the most tremendous waves; and forming, if I may so express myself, a green carpet, that, undulating on the broken wave, was never submerged, although continually varying its surface; and on which, as on a resting place, birds frequently alighted, or sat to repose themselves, as if it were a verdant down.

On a coast so remarkably dangerous, where no boat could land even in comparatively tranquil weather, these *safe rafts* were very interesting, and led naturally to the thought, whether such a sort of raft might not be constructed of other materials, fit, instead of birds, to carry men. The result of which was, it appeared to me, that if each sailor in a man of war had a cork mattress, and these mattresses were all linked together by cords, such a float, capable of landing safely even on breakers, would be produced.

Pleased with the thought I went to Bristol, and consulted a cork cutter there as to the quantity of cork necessary to support a man; and soon found, that a very moderate weight would do, and that cork shavings were then worth only 8*d.* per bushel, and chiefly sold for firing, or to make guards for privateers to fill the nettings.

* Nicholson's Philos. Journal, Vol. 26.—1810.

It therefore struck me, that, as mattresses are necessary in the navy for the hammocks, and nothing dryer than cork or easier to shave into a thin elastic body, it might answer the above end, to fill these mattresses with this substance, in a proportion equal to the support of a single man: and then a mass of them thrown overboard linked together by ties at each corner, where cords might be always attached, would form an extensive raft, capable of sustaining, out of the water, as many men as there were of these mattresses united; and thus conveying them on the tops of the waves, and depositing them safely on shore, or even on the surface rocks, when the sea retired with the tide.

To contemplate such a thought in imagination is truly delightful; but to believe, as I do, that the thing is practicable with ease, and not communicate it to others, is impossible. I have therefore done all in my power to extend the idea from my own bosom to the mind of the public at large, having first addressed my wishes and plan to that quarter, where the power of putting them extensively into execution alone exists.

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### BY MR. H. LAWSON.*

The absolute necessity that assistance to persons in danger of drowning should be speedy to be effectual, induced Mr. Lawson to consider what articles were most readily and universally to be found at hand in all cases, which could be converted into a floating apparatus, either for the use of the person in danger, or those who might venture to his assistance. What seemed to Mr. Lawson, in a great measure to answer all those conditions, is the buoyancy afforded by a common hat reversed on the water, which will thus admit of being loaded nearly with ten pounds weight before it will bear seven pounds with safety; and as the body of a man is about the same weight as the water, a buoyancy equal to seven pounds will effectually prevent his sinking. To render the hat still more manageable for this purpose, and less liable to fill with water by accidents, Mr. Lawson recommends, that it

* Tilloch's Philos. Mag.

should be covered with a pocket handkerchief laid over its aperture and tied firmly on the crown: Mr. Lawson asserts that with a single hat prepared in his manner, held by the tied part, a man who even does not know how to swim might venture safely to assist one in danger.

When two hats can be had, Mr. Lawson recommends that a stick be run through the tied parts of the handkerchiefs which cover them: and if more hats could be got, it would be still better; four hats may thus be fastened to a common walking-stick, which will thus sustain at least 28 pounds.

When a stick is not at hand, another pocket handkerchief tied to the lower parts of those which covered two hats, would thus unite them like a pair of swimming corks, and make them equally convenient.

If a man happen to fall out of a ship or boat, he may support himself till he can get assistance, by turning his hat upon its crown, and holding by its brim with his two hands, so as to keep the hat level on the water.

*Observations.*—The number of accidents that happen every year both to swimmers and skaters (the more melancholy, as the sufferers are generally in full health and vigour, and often in the midst of gaiety and frolic), make Mr. Lawson's contrivance, for affording instant relief in all cases, very valuable; and should therefore obtain them notice in every publication where they can be admitted.

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The following hints, on the same subject, were originally inserted in the Mercantile Advertiser of New-York.

The following experiment I have tried, and have no doubt it would be the means of preserving the lives of such of our seafaring people as should be so unfortunate as to abandon their vessel and entrust their lives to the boat.

A fourteen feet boat, with an empty puncheon lashed to the rising of the boat on the inside, will float with 4 men in it when full of water, and in that case may be bailed out.

And I believe that one puncheon to a ton, or four puncheons to a twenty feet long boat, will float with sixteen in like manner.

In the above case a boat may live in the sea, without turning bottom up.

WILLIAM THOMPSON, Brooklyn.

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Some Account of MR. DANIEL'S Life-preserver.*

THE body of the machine, which is double throughout, is made of pliable water proof leather; large enough to admit its encircling the body of the wearer, whose head is to pass between two fixed straps, which rest upon the shoulder: the arms of the wearer pass through the spaces on the outside of the straps; one on each side, admitting the machine under them to encircle the body like a large hollow belt; the strap on the lower part of the machine is attached to the back of it, and by passing betwixt the thighs of the wearer, and buckling, holds the machine sufficiently to the body, without too much pressure under the arms. The machine being thus fixed, is inflated with air by the bearer blowing from his lungs, through a cock affixed to the machine, a sufficient quantity of air to fill the machine, which air is retained by turning the stop-cock. The machine, when filled with air, will displace a sufficient quantity of water to prevent four persons from sinking under water.

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The following directions to Pilots and others, who have the management of undecked boats, were published by "An old Seaman," a few years since, upon the melancholy occasion of a boat being overset, going from Quebeck to Orleans, by which a valuable life was lost.

1. "Reduce the size of your sails. I have generally remarked that they are greatly disproportioned in this respect to the size of your vessels. 2. By no means ballast your boats with stone, iron, or such like matter. 3. Always keep on board, and which you may stow away under your benches, a convenient num-

* From the Annual Report of the Royal London Humane Society for 1809.

ber of casks of 20 gallons each, so as when filled with water, to enable your boat to be stiff and carry sail. With this precaution, if a sudden flaw of wind should upset the boat, she will float with the casks, and the persons on board may save their lives; and even one such cask will be sufficient to save the life of a man. If the ballast be of stone, the consequence is, that when overturned, she must go down with all on board. 4. Another advantage arises from water-cask ballast, which is, that when you are becalmed, you can discharge the water from the casks overboard, and have a light vessel to row: whereas if you carry stone ballast, and are long becalmed, and wish to have a light vessel for conveniency of rowing, you by throwing it overboard render the boat unfit for carrying sail when a fresh breeze springs up, and by this means are unable to reach the shore. 5. Always keep a funnel on board for filling your empty casks. 6. Your boat, when water-ballasted, sails much more lively, especially in rough water, than when ballasted with stone."

## RELATIVE VALUE OF GOLD AND SILVER COINS.*

| | | Sterling. |
|---|---|---|
| France. | Louis, coined before 1786 . | £. 0 19 10¾ |
| | do. since " . . | 18 10 |
| | Napoleon, or piece of 40 Francs | 1 11 8 |
| Hamburgh. | Ducat, . . . . . | 9 4½ |
| Holland. | Ducat, . . . . . | 9 4 |
| Portugal. | Moidore, . . . . . | 1 6 11¼ |
| Rome. | Sequin, . . . . . | 9 3 |
| Spain. | Pistole, or doubloon of 1801, . | 15 11½ |
| United States. | Eagle, . . . . . | 2 3 6 |
| | Half and quarter eagles in proportion. | |
| India. | Mohur of Shah Allum, 1787, . | 1 13 4½ |
| | Sucat Mohur, latest coinage, . | 1 9 2½ |

* From Kelly's Universal Cambist, 2 vols. 4to. London, 1811

SILVER COINS.

| | | Sterling. |
|---|---|---|
| France. | Ecue of six livres, . . . | £0. 4 8¼ |
| | Piece of 5 francs, 1808, Napolean, (100 cents) | 4 0¼ |
| | Franc of 1809, . . . | 9¾ |
| Hamburgh. | Rix dollar, specie, . . . | 4 7½ |
| | Florin, or Guilder, . . . | 1 8¼ |
| Portugal. | New Crusade, 1802, . . | 2 4 |
| Russia. | Ruble of Alexandria, 1805, . | 3 3 |
| Spain. | Dollar of late coinage, . . | 4 3¾ |
| U. States. | Dollar, 1802, . . . | 4 3¼ |
| India. | Sicca Rupee, (company's coinage) | 2 0½ |
| | Arcot Rupee, latest coinage, . | 1 11½ |

The above value is estimated from the essays of Mr. Bingley, assayer of the English Mint, and of Mons. Bonneville, essayeur du Commerce, at Paris.

PROPORTION OF THE ENGLISH POUND AVOIRDUPOIS, TO OTHER WEIGHTS.

| | | lbs. | |
|---|---|---|---|
| 100 lbs. | Avoirdupois, are equal to Amsterdam weight, . . . . . | 91 | 80 |
| " | Antwerp, . . . . . | 96 | 75 |
| " | Copenhagen, . . . . . | 90 | 61 |
| " | Dantzic, . . . . . | 103 | 07 |
| " | France, pois de marc, . . . . | 92 | 64 |
| " | Riga, . . . . . | 108 | 46 |
| " | Rome, . . . . . | 133 | 69 |
| " | Russia, . . . . . | 110 | 86 |
| " | Scotland, pounds Dutch weight, . . | 92 | 11 |
| " | Spain, Castilian weight, . . . | 98 | 40 |
| " | Vienna, . . . . . | 81 | — |
| " | Warsaw, new Polish weight, . . | 112 | 25 |

## MEASURES OF LENGTH.

| | Feet. | |
|---|---|---|
| 100 English feet are equal to Amsterdam, | 107 | 62 |
| " to Berne, . . . . . | 103 | 98 |
| " to France, Pieds de roi, . . . . | 93 | 89 |
| " to Rhine-land, common measure, in Germany and Holland, . . . . . | 97 | 17 |
| " to Rome, . . . . . | 103 | 45 |
| " to Spain, . . . . . | 107 | 91 |
| " to Sweden, . . . . . | 102 | 66 |

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The following are the number of acres, corresponding to ten English acres.

## LAND MEASURE.

| | | |
|---|---|---|
| England, roods, . . . . . | 40 | |
| perches, . . . . . | 1600 | |
| France, old system, arpents, . . . . | 11 | 84 |
| new system, ares, . . . . . | 404 | 68 |
| hectacres, . . . . | 4 | 05 |
| Ireland, acres, . . . . . | 6 | 17 |
| Scotland, acres, . . . . . | 7 | 87 |
| Saxony, acres, . . . . . | 7 | 84 |
| Spain, fanegadas, . . . . . | 10 | 47 |
| arrauzadas, . . . . . | 8 | 80 |

## ROAD MEASURES.

| | | |
|---|---|---|
| 100 English miles are equal to Irish, . . | 57 | 93 |
| " to Russia versts, . . . . | 150 | 81 |
| " German long, . . . . | 17 | 38 |
| " do. short, . . . . | 25 | 66 |
| " geographical, . . . . . | 21 | 72 |
| " French astronomical leagues, . . | 36 | 21 |
| " " marine do. . . | 28 | 97 |
| " " land measure 2000 toises each, | 41 | 28 |

The English mile is equal to $1\frac{3}{4}$ versts.

# PAPERS ON MANUFACTURES.

## ON THE MANUFACTURE OF WOOLLEN CLOTH.

The following paper was written by a regular Manufacturer, and the processes described are those in actual use in the west of England, where the finest Cloths that receive the London stamp are made.

Spanish wool is bought by the manufacturer ready sorted: to make the first quality cloth, he purchases two qualities, the 1st and 2d.—When the bags are brought to the mill for use, they are cut open, and the bagging carefully taken off. A woman is employed to pick off the straws, lint, &c. The wool is then taken to the scouring house, where a ley had been prepared, composed of one part stale urine and two parts water: or, three parts water, one part urine, and a small quantity of American pot-ash: the last is more generally used, from an idea, that the pot-ash neutralizes the urinary acid. When the ley is heated to such a degree, that the hand if immersed in it, can be retained in it but for a short time, a small quantity of wool is taken from the heap, thrown into the ley, and well worked, until the yolk and grease are removed; it is then thrown on railings placed across the furnace, and resting on the curb, so as to be kept warm by the steam. A second portion is then thrown into the boiler and worked as before: by the time this is done, the first lot will be sufficiently drained for washing; it is then taken to the swilling basket, small quantities washed at a time, and the instant it is immersed, the workman moves it backwards and forwards to open the wool, and that the stream may pass through it to carry off the yolk and grease. When well washed, the wool is thrown into baskets with handles, and left to drain till next day; it is then carried to the nearest pasture field, and spread on pieces of sail-cloth, previously laid down for the purpose, and then left until sufficiently dry: should the day be fair, the wool is taken in before it is quite dry, should it be cloudy it cannot be made too dry.

## REMARKS ON THE ABOVE PROCESS.

In the United States, when wool is purchased in the fleece, it is necessary to have it well sorted: bagging the wool is attended with considerable loss; the bags, by being tumbled about on the wharves, streets, ware-houses, and mill-seats, gather a large quantity of dust, which, passing through the bagging, soils the wool and adds considerably to the weight; the lint from the bagging mixes with the wool: and to separate it after finishing costs two pence sterling per yard, and if not separated will shew white upon the surface.

In scouring, the greasy matter, attached to the wool, chemically combines with the alkali of the ley, forming a saponaceous compound, which mixes with the water in washing, and thereby becomes detached. The natural oil, exuded from the sheep, would be preferable to artificial oil, could the yolk be separated, leaving the oil in the wool, for the yolk makes the wool work hard, and leaves so much filth in the cards of the machines as to fill them up and prevent them from working: the separating the one without the other appears impracticable; therefore scouring must be considered absolutely necessary.

Urine, when used, should be stale, that it may have become decomposed, for when fresh it abounds with acid; that, which is voided by persons living high and drinking much, is not so good as that of those who live low; for this reason one bucket full, collected from a prison or poor-house, is considered as worth two from families living well.*

A ley, when made, may be used for fourteen or fifteen days, by adding a sufficiency of the mixture to keep up the original quantity; when new, it does not scour so well: it is usual to let the old liquor settle, to skim off the filth, and throw one third of it into a cask to mix with a fresh making.

Wool, when scoured, should be used as soon as possible; for if two lots are made up, one soon after scouring, and the other

* Compare Archives, Vol. 1. pp. 99—100. *Editor.*

three months afterwards, the first will be worth from 10 to 15 per cent. more than the other.

Fine wool should never be scoured after coarse, but coarse may follow fine without any inconvenience or injury.

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REMARKS BY THE EDITOR.

In order to have a cloth of uniform appearance and quality, besides the foregoing directions, the following should be carefully attended to.

The wool intended for a piece of cloth, must not only be of the same degree of fineness, the same length, but it should be taken from animals of the same sex and age. Thus the wool of rams should not be mixed with that of ewes, nor that of wethers or lambs with either. Pulled wool and shorn wool should also be kept apart; and above all, the wool of diseased and healthy animals should be worked up separately on account of the influence which a state of health has upon the capacity of the wool for taking colour. On this subject, M. Roard, director of the Dyeing establishment in the Imperial manufactories in France, is very decisive; he says, "all his experiments prove that the affinity for the colouring matter in wool, varies according to the species, and to the healthy or diseased state of the animal, and that the wool of healthy merinos is always more highly coloured than the wool from diseased animals."*

On the scouring of wool, M. Roard adds, first, it is dangerous to raise the temperature of the fluid above 60° (of Reaumur) or to leave the wool in it longer than a quarter of an hour, for it is liable to be very soon injured in boiling water.

2. Wools scoured at two operations can never be rendered completely white. This effect seems to proceed from a change of state in the greasy colouring matter, which by becoming more highly oxydated loses its solubility.

3. Wools constantly assume in copper vessels, solid colours,

* Annales de Chimie, No. 158. This paper is translated in Tilloch's Phil Mag., but incorrectly. The errors have been corrected.

more or less deep, which even at the lowest degree of colouration, prevent them from taking the first shades of a tint. This effect is obviated by the use of tin vessels, the oxide of which cannot alter the whiteness of the wool during steeping.

4. The opinion of M. Roard on the superior whiteness of cloth made from wool spun in the natural yolk or grease, over that made of wool previously scoured, has already been given ;* but it must be received with some qualification. In some merinos, the extrication of this natural perspirable fluid is so abundant, as to colour the wool and to adhere like wax, and if carded without scouring, it will certainly clog the cards ;† but if the animals have been well washed in clear water, and afterwards kept for a few days in a clean pasture before shearing, it will be found, that the superabundant yolk will generally be washed out, and yet enough of the natural oil left in to make it card easily. The wool of the common sheep of the United States and of England, have but little of this grease or yolk, and therefore an interval of several days between washing the sheep and shearing them are indispensable to permit it to rise.

It may be remarked too, that at the wool fair held in Ireland in July, 1811, it is stated by Lord Sheffield, in his annual *expose* of the state of the wool trade, that "the manufacturers were satisfied with the manner in which the wool was made up, though merely river washed upon the sheep's back."‡

5. Full grown wool, shorn from the live animal, makes the best

* Archives, vol. 1, p. 96.

† The grease (*suint* in French) or yolk, is a fatty unctuous substance, with a very strong smell, which is supplied in the sheep by sweat; when dissolved in water, and filtered to disengage it from the earthy and animal matters, it is of a yellow brown colour, more or less inclined to red, and composed according to M. Vauquelin, of a soap, with a basis of potash, combined with carbonic, acetic, and muriatic acids. Filtration likewise separates a white matter floating on the surface of the grease, and which in scouring does not combine with the alkalies: it appears to be of the nature of suet: it becomes liquid at a low temperature, and takes fire very easily." M. Roard.

‡ Literary Panorama, vol. x. p. 1144. London.

cloth; that which is pulled from the skins of slaughtered sheep answers very well for flannel, hosiery, &c.; but as such wool in general is not full grown, the fibres are weak, and the roots preventing it from fulling properly, the cloth made from it is harsh.

6. The wools of sheep from different countries, ought not to mixed in the same web, on account of their different capacities to take dyes. This fact was discovered in the following manner. "Having ascertained," says M. Reard, "that the causes which influenced our operations could not arise from the manipulation of the dyer, we complained to our wool merchant of the bad quality of his goods. He then acknowledged that he mixed the wools of Flanders with those of Holland, as customary in the trade; and that though all the dyers had constantly complained of the same defects, yet as they had neglected to acquaint him with the cause, he had not been able to take such measures as to prevent it in future. These wools have another defect, which it is important to mention; I mean the increase given to them by passing them through buttermilk, and which amounts almost to one-eighth of their weight. They are surcharged with a white dusty matter, which after careful and repeated washing, still furnishes a sufficient quantity of acetous acid to change a great number of results in dyeing."

Dr. Parry says, "wool should be kept in baskets or wooden compartments, rather than in bags, which are liable to be rotted by the yolk. Wool is subject to become damp by absorbing moisture from the atmosphere, and will generally be found to weigh more in the winter, and of course to waste more in scouring than in hot weather, when it is first shorn. To this change may be attributed the common prejudice, that wool grows after having been separated from the animal. If it be re-examined, after a continuance of hot and dry weather, it will be reduced by evaporation to its original weight." Dr. Parry adds,

"Wool certainly appears to become somewhat coarser by lying very long in the yolk, which according to Vauquelin, may arise from some incipient decomposition. I know, however,

that it may be so kept two or three years without the least injury.*

The sorting of wool into various qualities, is of the first importance to insure a handsome piece of cloth. In Archives, vol. I, p. 204, the reader will see the accuracy and minuteness with which the fleece is divided in England. The paper deserves the serious attention of the manufacturer, being written by Mr. Luccock, a professed wool stapler; and although it cannot be supposed, that any one not regularly bred to the business of wool sorting, will be able to divide it so minutely as one of the trade, yet it is proper to impress upon the minds of those unacquainted with the business, the necessity of paying as much attention as possible to the directions given; for by mixing fine and coarse in the same piece, or wool of different denominations, the cloth cannot be dressed handsomely, nor will it wear well, or take the intended colour equally. The dead ends must be clipped off with a pair of scissors or shears,† and then picked and greased in the proportion of one pound of hog's fat, to ten pounds of wool,‡ and thoroughly pulled, opened and mixed, after which it is to be broken on cards, of a degree of fineness proportioned to that of the wool: then divided equally for warp or chain, and filling or woof. That which is intended for warp, must be twisted smaller and closer than that for filling, which may be as slack as possible, provided it be well woven. One person should spin the chain and another the filling, to insure uniformity in the thread, and to prevent the cloth from puckering or cockling when dressed. Keep the wool clean from motes, lint or dust in spinning. The *chain* should be spun with the wheel cross-banded. Many clothiers spin both chain and filling with the cross-band; but when the filiing is spun

* The wool will, nevertheless, look coarser by being kept: as may be determined by keeping a small specimen for a year in paper. Wool which cannot be worked up the season it is shorn, ought not to be washed, as it is not so liable to be destroyed by moths if the grease be left in. *Editor.*

† If the wool to be used, be that of dead sheep, after the skins are washed and dried, they may be spread upon a table, and clipped with sheep shears.

‡ Inferior sweet oil is used in Europe. Benne oil would probably answer

without crossing the band, it makes the softest and prettiest cloth. It is well known that wool spins best in warm weather. When spun, the thread is said to be *warped*, and must then be stiffened with size, made either of glue, or by boiling shreds of parchment or of skins or sinews of animals in water. When dry it is to be given to the weavers, who mount it on the loom." The warp being on the floor, the weavers, who are two to each loom, one on each side, tread at the same time alternately on the same tredle; that is, first on the right step, and then on the left, which raises and lowers the threads of the warp equally: between which they throw transversely, the shuttle from the one to the other: and each time that the shuttle is thrown, and a thread of the woof is inserted within the warp, they strike it conjointly with the same frame in which is fastened the comb or reed, between whose teeth the threads of the warp are passed, repeating the stroke as often as is necessary: in some cloths no less than twelve or thirteen times: six with the warp open, and seven shut. It is taken off the loom by unrolling it from the beam, on which it had been rolled in proportion as it was woven, and then given to be cleared of knots, ends of threads, straws, &c. which is done by little iron nippers."*

It is requisite to beat up the cloth equally, or it will cockle; and to trim with shears as it is woven; for if all knots are not cut off before the cloth is filled, the clothier sometimes leaves holes by picking them out.

Old harnessing should be avoided in weaving cloth, as they abound in lint or floss.

*Fulling.*—The fuller then commences his operations, by scouring the cloth with urine, or with that peculiar earth called *Fuller's earth*, well cleaned and steeped in water, put along with the cloth in the trough in which it is filled. The cloth being again cleared from the earth or urine, by washing it in water, is returned to the former hands, to have the lesser filth, small straws, and almost imperceptible knots taken off as before: then it is re-

* Millard's Pocket Cyclopædia, p. 416. London, 1811.

turned to the fuller to be beaten and filled with hot water in which soap has been dissolved. For fine cloths, this soap should be of the finest and whitest kind.

*Smoothing.*—"After fulling, it is taken out to be smoothed; that is, to be pulled by the lists lengthways, to take out the wrinkles and creases occasioned by the forces of the mallets or pestles falling on the cloth when in the troughs. The smoothing is repeated until the fulling is finished, and the cloth brought to its proper breadth: after which it is washed in clear water to free it from the soap, and given wet to the carders, to raise the nap, on the right side, with the thistle [teazel] with which they give it two rubs or courses, the first against the grain, the second with the grain." *Millard's Cyclop.*

For the purpose of raising the nap on cloths, hand-cards are at present universally used in Pennsylvania; but they answer the end very imperfectly, and increase the expense of manufacture very much, when compared with the operation of the GIG MILL, an implement which should be introduced as soon as possible into every cloth manufactory. This gig mill consists of teazel (*Dipsacus Fullonum*) fixed in numerous small frames, which are again fixed in a cylindrical frame of about two feet diameter and composed of slats or ribs having groves cut through their whole length, to receive the frames containing the teazels. The cloth passes over the gig mill sufficiently close to raise the nap, and winds round a cylinder below. The mill is turned by water or steam.

From the testimony given by the cloth manufacturers to a committee of the British house of commons, it appears that the following advantages are derived from the use of the gig mill.*

* The history of the gig mill is somewhat curious. It has been used in Gloucestershire from a very early date of the woollen manufacture, and yet is prohibited by two statutes passed in the reign of Edward IVth. This, however, is not the only instance in which European governments have interfered with the manufacturers, to the injury of the nation and of the individual. In other counties, as in that of Wilts, it was first introduced about five years ago, previously to which the same work was either done by hand, or sent to Gloucestershire to be dressed. Gig mills are now in general use.

"It does not stretch out the cloth to more than one-twentieth part of that which was its length, when it came out of the loom: and the cloth is not found to shrink more from the use of this machine, than if it were dressed with the hand only; it is moreover rendered softer, mellower, and more uniform, than that which is dressed with the hand." The use of this machine requires attention and practice to derive all the benefit it is capable of yielding. It is partially in use in the states of New York and New England, and as the teazle seed is very easily procured, the plant should be cultivated by all concerned in the manufactory of cloth.*

The spring shuttle so greatly diminishes the labour of weaving, that it ought to be introduced in all woollen, cloth, linen, or cotton manufactories.

*Shearing.*—"The cloth being dried after this preparation [on tenter hooks] the shearman gives it the first cut or shearing. This done, the carders, after wetting it, give it as many more rubs, or courses, with the teazel, as the quality of the cloth requires; always observing to begin against the hair, and to end with it: and to begin with a smoother thistle, proceeding still to a sharper one, as far as the sixth degree. The shearman and carder repeat these operations, till the nap is well ranged on the surface of the cloth from one end to the other."

The *shearing of cloth* is an operation upon which much of the good appearance of the fabric depends. In the United States this has hitherto always been performed by hand, by means of the old fashioned shears; but within a short time several shearing machines have been invented in the states of New York and New England, to go by water or steam; and all have their advocates. It is believed the number amounts to eight. The common hand shears have also been set to go by water, and so fixed as to be thrown out of geer when they have come to the end of the table on which the cloth they are shearing, is stretched. The Editor saw these at work in two manufactories during the last

* In the present No. a paper is given on the cultivation of this plant.

autumn, and can bear witness to the excellence of their performance.

Shears and all machinery, go so much more regularly by means of the *steady* power of water or steam, that manual labour ought never to be employed, where either of those powers and the workmen necessary for their erection can be obtained.

*Dyeing.*—"After the process of dyeing the cloth, it is washed in water, and the shearman lays the nap with a brush on a table, and hangs it on the tenters, where it is stretched both in length and breadth enough to smooth it, and brought to its proper dimensions, without straining it too much; observing to brush it afresh the way of the nap, while yet a little moist on the tenter."

*Pressing and Glazing.*—"When quite dry, the cloth is taken from the tenter, and brushed again on the table to finish the laying the nap: it is then folded, and laid *cold* under a press, to make it smooth and even and to give it a little gloss. The gloss is given by laying a leaf of vellum, or cap-paper, in each plait of the piece, and over the whole, a square piece of wood, on which, by means of a lever, the screw of a press is brought down with the degree of force judged necessary. The cloth is now fit for sale."*

It appears from a work by Mr. Bakewell,† that in England "cloth is now finished without that hard shining surface which was given to it a few years since by *hot pressing*, which prevented the softness of the pile from being felt. By the present mode of *cold pressing*, the softness of the pile becomes immediately perceptible to the touch, and is considered as one of the most distinguished and essential qualities of good cloth."

No reason can be given for the original introduction of the absurd practice of hot pressing cloths, except that of catching the eye, by the shining appearance given to them, and give a temporary smooth and agreeable feel. But *good wine needs no bush*,

* Millard's Pocket Cyclopædia.

† Observations upon the influence of soil and climate on wool. London, 1808.

and hence in France, a shining appearance has never been deemed necessary to the sale of cloth; and those who have had the satisfaction to wear a fine French broad cloth, invariably prefer them not only on account of the soft, mellow feel they communicate to the hand, but also by reason of their superior durability. A French cloth looks well to the last, and bears hard usage well, but it is universally known that the British cloths, (with probably some few exceptions) soon wear rough, and do not last near so long as the former. Indeed the good taste of the people of the United States has within a few years, taught them to despise the vulgar gloss of an English broad cloth, and hence almost constantly order it to be spunged previously to being made up. But as it is probable, that with a certain class of people, shining coarse cloths will be preferred, the hot press will be necessary for their gratification.*

The weather too has an influence upon the feel of the cloth. Dr. Parry says, he was informed by the manufacturers of the West of England, that in very hot weather, they cannot make a piece of cloth from Spanish wool so good in appearance, by nearly two shillings a yard, as it would be if made in a cooler, moister season. In Yorkshire it is well known. Mr. Bakewell says, that cloth dried in hot weather, or in an over heated store, will not finish so well, or feel so soft, as that which is dried by a more moderate degree of warmth, and in a moister state of the atmosphere.

## ON THE PROPERTIES OF BLUED STEEL.

By Mr. Wm. Nicholson.†

IN making springs of steel the metal is drawn or hammered out and fashioned to the desired figure. It is then hardened by ignition to a low red heat and plunging it in water, which ren-

* The most powerful press, (considering the power) the Editor ever saw, is the invention of Israel Nicholls, of Otsego county, New York. See the head "Useful Arts," in this No.

† Philos. Journal, vol. 11. p. 63.

ders it quite brittle. And lastly, it is tempered either by blazing or blueing. The operation of blazing consists in smearing the article with oil, or fat, and then heating it till thick vapours are emitted and burn off with a blaze. I suppose this temperature to be nearly the same as that of boiling mercury, which is generally reckoned to be at the 600° of Fahrenheit, though, for reasons I shall in future mention, I think this point requires to be examined. The operation of blueing consists in first brightening the surface of the steel, and then exposing it to the regulated heat of a plate of metal or a charcoal fire, or the flame of a lamp, until the surface acquires a blue colour by oxidation. The remarkable facts which I have here to present to the notice of philosophers are, that Mr. Stodart assures me that he has found the spring or elasticity of the steel to be greatly impaired by taking off the blue with sand paper or otherwise; and, what is still more striking, that it may be restored again by the blueing process without any previous hardening or other additional treatment.

Mr. Hardy, who is meritoriously known as a skilful artist, assured me some time ago that the saw-makers first harden their plates in the usual manner, in which state they are more or less contorted or warped, and are brittle;—that they then blaze them: which process deprives them of all springiness, so that they may be bended and hammered quite flat, which is a delicate part of the art of saw making;—and that they blue them on an hot iron which renders them stiff and springy without altering the flatness of their surface. Mr. H. finds that soft unhardened steel may be rendered more elastic by blueing, and that hard steel is more expansible by heat than soft.

It is very difficult to reason or even to conjecture upon these facts. They certainly deserve to be verified by a direct process of examination.

## COPPER PLATES FOR ENGRAVING.

The following method is now followed in London for preparing Copper plates.*

A SHEET of copper must be chosen as free as possible from flaws, and of a somewhat greater thickness than the finished plate is intended to be: it is then to be scraped all over with a *scraper*, in shape something like the head of a spear, and fixed in a handle long enough to go under the arm, the other hand holding the tool near the cutting part. When it has been perfectly freed from the outward crust, scales, or rust, it must be carefully examined to see if there are any holes or flaws in it; if there are (which is almost always the case), they must be scooped out by a tool called a *scooper*. This being done, it is next to be well and regularly hammered all over on an anvil, of a considerable degree of convexity, in order to harden it; and afterwards on a broad and nearly flat anvil, to flatten and planish it. After this has been performed, it is to be cut to the size wanted, and the edges a little chamfered or bevilled, and is then to be stoned, that is, rubbed all over with a fast cutting, but not very coarse, grit stone, care being taken to use a great quantity of water, to float off the particles mutually abraded from the copper and stone. When it is judged that all the marks of the scooper and hammer are rubbed out, a stone of a fine grit is to be used in the same manner, and after this a third.

The two first-mentioned stones are sold at the ironmongers in London, under the name of "Carpenters' stone;" the best kind are brought principally from the coal fields in the neighbourhood of Bilston in Staffordshire. The stone last used is called "Water of Ayre stone," and brought from Dumfriesshire. All the three kinds contain a considerable quantity of argil in their composition. Lately, a very fine grained argillaceous grit, brought from the neighbourhood of Sheffield, has been used instead of the Bilston stone.

After the operation of stoning has been performed, the plate is

* Rees' Cyclopædia.

to be "coaled." This is done by rubbing it first with charcoal of birch-wood, or alder, and water, and then with charcoal of willow: the latter gives the finer polish, particularly if oil instead of water be used. Sometimes the plates are finished by burnishing, but this is not now often done.

The charcoal is not prepared by the copper-plate makers, but is procured from the dealers in that article by the workmen, who take a plate of copper, and by trial discover which pieces are fit for their purpose.

## METHOD OF GIVING THE GRAIN AND HARDNESS OF STEEL TO COPPER.

By B. G. Sage.*

MARGRAFF and Pelletier have published their researches on the union of phosphorus with different metallic substances: the French chemist has improved this process, and it was by repeating and varrying his experiments that I discovered that the surest and speediest means of phosphorizing copper was to take the metal under the metallic form, to fuse it with two parts of animal glass, and a twelfth of charcoal powder; but it is essential that the copper should present a great deal of surface,—an advantage obtained by taking shavings of that metal, which are placed in strata with animal glass mixed with charcoal powder. I expose the crucible to a fire sufficiently strong to fuse the animal glass. There is then formed phosphorus, the greater part of which burns, while another combines with the copper, in which it remains incarcerated till no more is disengaged, though kept in fusion for twenty minutes under the animal glass which has not been decomposed.

When the crucible has cooled, and is broken, the phosphorated copper is found in the form of a gray brilliant button under the

* From the *Journal de Physique*, Messidor, an. 12. Translated for Nicholson's Journal, Vol. 20.

glass, which has passed to the state of red enamel. On being weighed, it is found that by this operation its weight has been increased a twelfth.

If the phosphorized copper, when fused, falls on a plate of polished iron, it extends itself over it in the form of plates differently figured, which exhibit the play of colours of a pigeon's neck.

The phosphorized copper is much more fusible than common copper: it may often be fused under charcoal powder without losing any of its properties.

The same phosphorized copper, when exposed a long time under the muffle, separates only with great difficulty from the phosphorus.

The copper thus combined with phosphorus acquires the hardness of steel, of which it has the grain and the colour: like it, it is susceptible of the finest polish; it can be easily turned; it does not become altered in the air. I have kept buttons of polished phosphorized copper in my laboratory for fifteen years, without their experiencing any alteration. The copper emits no smell when rubbed. Were it ductile, it would be of the greatest utility, since no fat bodies seem to have any hold of it.

In the phosphorization of copper there is only a part of the animal glass decomposed, because a quantity of charcoal necessary to phosphorize the whole acid has not been employed: but it is necessary that this should be the case in order that the vitreous scoria should be sufficiently fluid for the phosphorus to be disengaged and to collect itself readily.

The dark red enamel which is formed in this experiment may be employed with advantage for porcelain and enamels, as this red does not alter in the fire.

Copper can combine with phosphorus only in the dry way. If a cylinder of phosphorus be put into a solution of nitrate of copper diluted with four or five thousand parts of water, copper under the metallic form will be found at the end of eight days crystallized and ductile, forming a case to the cylinder of phosphorus.

## DESCRIPTION OF THE COPPER-MINES IN THE PARIS MOUNTAIN, IN THE ISLAND OF ANGLESEA.

From a tour through England and Wales, in 1791.

THESE Copper-Works appear like a vast quarry dug in the mountain. They are totally unlike the usual appearance of copper-mines, and seem to resemble them only in affording ore. Instead of finding a narrow vein of copper, you are presented with one vast rock of ore. They separate it from the quarry with gunpowder, a process attended with some degree of danger to the miners, who frequently receive damage from the fragments that fly about. Whenever they set fire to their train, they shout to their companions, as a signal for them to keep off. The agent of the works placed us in a situation which he thought secure; but, after the explosion, a great deal of the shattered fragments came tumbling about our ears. It is conveyed either in carts, or in buckets, to the surface, and rises most beautifully rich in its appearance; although, I believe, its value is not estimated by its beauty. After the ore is dug, the first process here is to calcine it in a furnace, by which means the sulphur is expelled, and they can afterwards separate the waste from the pure ore, making thus a great saving in the carriage to the different smelting house. Nor is this the only advantage they derive from the calcination of the ore: when fire is applied to it in the furnace, it begins to burn, and will continue in that state from six to seven, eight, or nine months. During all this time, vast quantities of sulphur exhale from the ore. This is conveyed in vapour through conductors to a large oblong receiver with a concave roof, where, becoming condensed, it adheres to the sides of the receiver, or falls in a fine powder to the bottom. This is what the chemists call *sublimation*, and that which is obtained in this operation of the ore they call flowers of sulphur. It is then melted in a large copper, and poured off into moulds, when it becomes stone brimstone. Such vast quantities of sulphur are contained in the ore dug here, that more brimstone is made from the works of this company, than is necessary for the consumption of England.

Being almost stifled with the sulphureous air of the Paris Mountain, we were obliged to leave it, and brought with us several specimens of this beautiful copper, which, from its colour, is called the peacock ore; but there is one circumstance I have omitted to mention, and which I think the greatest curiosity of the Paris Mountain. A natural spring of water flows from the bed of ore, so impregnated with copper, that it will discharge it upon the smallest approach of iron. It is conveyed from pumps through wooden troughs, and we perceived a thin coat of copper incrusting even the heads of the nails that it flowed over. There is also a large quantity of water brought from the quarry, which is more strongly impregnated with the copper, and which assumes a beautiful green colour. This they convey with care to several large cisterns, formed for the purpose, which are first filled with plates of cast iron.

The instant the iron comes in contact with the water, the copper is precipitated. For the acid in the water, which before dissolved the copper, now preferring the iron, discharges the copper and dissolves the iron. Thus the iron takes the place of the copper as fast as the former dissolves and the latter precipitates. And it is this phænomenon which has led many into numberless errors with regard to the transmutation of metals. Finding that the iron vanished and copper appeared, they inferred that the iron was changed into copper, whereas it is merely a change of place, the iron assuming the situation of the copper, and resigning its own to that metal.*

The truth of this may easily be perceived, by applying the

* The iron is turned every day to shake off the incrustation of copper formed upon it, and this is continued till the iron is dissolved. The workmen then drain off the water, and rake together the ore in the form of mud, which, when it is become, by drying, of the consistence of paste, they bake in ovens constructed for the purpose, and export it with the ore to Swansea and Liverpool. One ton immersed in this manner, produces near two tons of copper mud, each of which when melted, will produce 1600 wt. of copper. This sells at a much higher price than the copper, which is fluxed from the ore. This method of attaining copper by means of iron, had been long practised in Germany. Bingley's Tour in North Wales. Vol. 1. p. 274. London, 1800. *Editor.*

Prussian alkali to the water that has discharged its copper, when a precipitation of iron will instantly take place.

A great quantity of copper is thus gained from the water in the mine, which is by much the richest and most valuable of any they have.

This amazing resource for copper was discovered by a poor woman digging peat. She found something more than common in the appearance of the earth, and communicated the intelligence to her husband. The news soon spread; it proved to be an almost inexhaustible bed of ore. We naturally enquired what reward the poor family had, that first brought such a fund of riches to the island. They all assured us, that no reward was ever given. An Englishman can hardly credit this, especially when he is told, that one noble earl alone derives an income of thirty thousand pounds yearly from these works.

## A PARTICULAR ACCOUNT OF THE EXTRAORDINARY COLLECTION OF SALTPETRE IN FRANCE.

THE following extract, from Mr. Prieur's Account of the extraordinary collection of Saltpetre, which took place in the second and third year of the French Republic, gives a wonderful proof of the energetic impulse which pervaded that nation, when in a manner unprepared to resist the formidable force in league against it.

"One still recollects with astonishment and admiration, the enthusiastic spirit of every Frenchman, at a time, when their country was in the greatest danger; and the prodigious efforts which resulted from it, towards furnishing an enormous quantity of arms of every kind, and of gunpowder, which the nation was much in want of—the almost instantaneous erection of numberless building, in all parts of the Republic, for making and repairing all sorts of polished arms, muskets, and cannons of every bore, both for the land and sea service; as well as the incredible quantity of ammunition, utensils, machines, and other necessaries for the con-

sumption and use of more than 900,000 men, stationed at one time on the frontiers, independent of the national guards in the interior:* in a word, so great a toil, as may be easily conceived, put in action an incredible number of workmen.

"It was found necessary to employ therein, those men whose labour was of an analogous kind; that is to say, men of different vocations in the rough work of wood and metals; and even such as were acquainted with the more refined and finished parts. It was necessary also, in a manner to make apprentices of those workmen, who had been taken from their usual occupations, and to put them under intelligent and skilful masters; these also were to be instructed by artists still more experienced, who would throw a light upon the practical part, rectify, simplify, and entirely change it, in certain cases, by taking advantage of the acquired and accurate knowledge of the first men of the kind: in short, it was necessary, that all should be constantly instructed, moved to action, encouraged, and sustained, by a powerful government, which gave every proof of being devoted to the service of its country, and was endowed with sound judgment and energetic will. But if I may be allowed the expression, it was necessary to give impulse to a whole nation, when the business was brought forward, of extracting every where the saltpetre earth contained in the French soil. This art was, in fact, an object more confined; it was almost generally unknown. Private interest was alarmed at seeing it set on foot; and still more numerous prejudices produced a variety of obstacles. Men could not be persuaded that persons so untaught, and at that time perfect strangers to the business, could all at once engage in it with success: they could not believe that France was so rich in that precious commodity, which was never known to have been extracted in sufficient quantity for ordinary use; and of which a

* To give a full idea of the immensity of this fabrication, it will be within bounds to declare, that, in one month, there were delivered from the founderies, 597 brass, and 452 iron cannon, of different bores; and 7000 brass, and 12 or 13,000 iron cannon, were mounted fit for service, in the space of one year.

full supply had only been obtained, by means of what was brought from India.

"In the mean time, at the invitation of the National Convention, proclaimed by a decree of the 14th of *Frimair 2d year*, the citizens gave themselves up to the making of saltpetre. The number of buildings erected in the Republic, on this grand occasion, amounted rapidly to 6000. Necessary instructions were every where distributed by order of government. Erance was divided into large districts, each of which was continually surveyed, by an inspector skilled in arts and sciences. Under each inspector, in every department, was placed a former Director of the National Administration of Saltpetre Works; who appointed in each district, a citizen sufficiently intelligent to preside over the formation of the offices, and to regulate the works: and thus was activity established in every place at once.

On the other hand, a summons was issued for every district to send two robust and intelligent cannoniers to Paris, to receive their instructions from the most skilful persons*; who were to explain to them the art of preparing saltpetre—of refining it, and of making gunpowder; and to some of them, the mode of casting cannon. These pupils were then sent back into the different establishments, to assist in the works according to their capacities. Government kept up an active correspondence with all its agents; it supplied them occasionally with every necessary, and every where made easy the executive part. It was known, that every district could easily furnish a thousand weight of saltpetre every decade, and orders were given for that quantity; places were pointed out where to send it to; the means of conveying it were

* There were sent to Paris, in consequence of this order, about 1,100 men, to whom citizens Guyton, Fourcroy, Dufourny, Bertholet, Carny, Pluvinet, Monge, Hassenfratz, and Perrier, gave instructive lectures, on the fabrication of satpetre and cannon. This course commenced on the first *Ventose, an* 2, and the summary of each lecture was formed into a little work, and printed by order of the Committee of Public Safety. This Committee also gave charge to Citizen Monge, to draw up a complete description of the process for making cannon; in consequence of which, he published a most valuable work upon that subject, in large 4to. with a number of plates.

fixed upon; and frequent accounts were rendered of every operation. In short, so much care produced the desired effects; more than sixteen millions of pounds of rough saltpetre were collected in one year;* and the working of it up, although recalled in the following year, to the laws formerly enacted, still yielded nearly five millions and a half of this saline substance.

"But thus filling the magazines was not sufficient, it was necessary to refine it for making powder; the former mode was too tedious, too embarrassing, in a word, was impracticable, considering the urgent necessity for powder. A new and more advantageous process was proposed by M. Carny, which when properly executed, requires less time, consumes less fuel, disposes the saltpetre to dry more readily, demands less extent of ground and buildings, and consequently occasions less loss of saltpetre.

"In a short time, the refinery of *l'Unité* was built, on the abbey-ground of St. Germain-des-pres, at Paris. Saltpetre flowed there in profusion; and this establishment alone yielded in the refined state, regularly every day near 30,000 lbs.†

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## Information concerning some of the Silicious productions of the United States that are proper for military purposes.

*In a letter from Samuel L. Mitchill, member of Congress, &c. to the Editor.*

A FEW days ago, I read in the Commercial Daily Advertiser of Baltimore, an extract of a letter from London, dated November 2d, 1812, which particularly attracted my attention. It stated, that the British ministry, a little before that time, had, in addition to other restrictions and prohibitions on American

* The summing up of the decadary accounts, addressed officially to government announce a production of 16,754,039 lbs. of saltpetre, from the 14th *Frimaire, year* 2, to the same date *year* 3.

† It was in part burnt, by accident, on the 4th *Fructidor, an* 2. which circumstance did not long interrupt the business; it was renewed at length, although on a less scale than before.

ships, *caused such as had ballasted with "chalk" to discharge the same, lest some "flint-stones" should be found among it.*

It is generally known that *chalk* constitutes the basis or principal matter of the soil in several counties of England. This is the case in Middlesex, where the metropolis stands, and on both sides of the Thames; and it is as well understood, that the chalky strata contain great numbers of *silicious bodies.*

CHALK and SILEX being there very plentiful and cheap, are purchased at that grand resort of vessels, either separately or together, for ballast. In some places to which they are carried, they serve the further purpose of merchandize. In the United States, for example, chalk is sold for a variety of economical purposes; and it is affirmed, that the silicious stones bring a good price at the Canton market; being bought by the Chinese to help their manufacture of porcelaine.

Some of the masses of silex bedded in the chalky strata of England, are employed in the preparation of gun-flints. Those manufactured articles have heretofore been largely imported thence into North America. They have been procured upon such easy terms, that our people have too much overlooked their domestic treasures of silex. The British government, naturally enough supposes, that nature has denied it to us; and in refusing to let it be transported as ballast, they conclude they shall deprive us of a material so essential to the effect of fire-arms.

To remove all uneasiness upon a subject of so much importance, measures were adopted by the commander of the forces at New York, early in August last, to explore the banks of the river Musconetung, in the state of New Jersey; and to bring to the view of those whom it concerned, the silicious region thereabout.

Since the report upon that undertaking was made, other information has been brought to me, which I take great satisfaction in stating to you.

Pennsylvania contains silex. Robert Whitehill, Esq. one of her representatives in Congress, showed to me and to many others, a nodule of true silex, of a cancavo-convex fracture, of a

blackish colour, and of a greasy feel. When broken, it was semi-transparent at the edges. It seemed as if it could be made into excellent flints for muskets; and it was decomposed so far at its surface, as to be covered with a whitish coat. The specimen was found about four miles from Harrisburgh, in Paxton township, Dauphin county; and it is alleged that the article abounds near the same place.

Silex has been discovered in Virginia. William M'Coy, Esq. one of her members in the national legislature, assures me that there is an abundance of a black species, about two miles from the town of Franklin, in Pendleton county; and in various other parts of that vicinity. He says the inhabitants had frequently made flints for their guns, from the crude materials lying over the ground. The natural masses are of different sizes, from one pound to ten or twelve.

A good supply of silex can be furnished by Georgia. My intelligent correspondent, John Le Conte, Esq. of Riceborough, described to me very lately, a parcel of silicious stones, near Briar-creek, on the road from Augusta toward the sea. Some of them were pure silex. Others approached to agate and chalcedony. On what is called the *old road*, there appears to have been, as this accurate observer declares, an Indian manufactory of weapons. Many of them appear to have been fractured or chipped off, evidently for the purpose of making those arrow-heads or spear-heads, which are now almost the only remaining vestiges of the aboriginal arts, in that region. It is to be observed, that this very tract of country contains the famous oyster-shell, or lime-stone ridge.* Among the modifications of silex, this gentleman mentioned one sort, the outside of which was calcareous, abounding with small shells, that still retained their characteristic shapes.

It is also stated upon authority highly respectable, that at a place called Mobley's pond, in Burke county, and at the distance of four miles from Savannah river, there is a great quantity of

* See Bartram's Travels for an account of this singular mass. *Editor.*

rock-flint, of fine quality. The stratum is reported to contain, both the *opake* or *black* silex, and the *semi-transparent* or *oily*. General Twiggs is quoted as a witness of those things, and of the additional fact, that he, often during the revolution war, obtained supplies of flints from this place.

These might seem to be enough: yet I will point your attention to certain other localities, in relation to silex.

The honourable Charles Tait, of the Senate of the United States, brought to Washington in the beginning of November last, a fragment of a silicious stone, taken by himself from the village of Abbeville, in South Carolina. It was a coarse chart, with a straight and angular fracture. Its outside had been altered by exposure and was converted to a yellowish crust. It yielded sparks readily, and contained crystals apparently of amphibole or schoerl. Though this sample did not seem fit for gun-flints, it may nevertheless aid investigation, whenever the silex of our country shall be the object.

Several years ago, I was informed by a military officer of experience and observation, that silex abounded in the state of New York. My subsequent opportunities of visiting the region referred to, have confirmed that gentleman's information. Silex is stratified with the lime-stone, not only at Black rock, on the east side of Niagara river, a short distance below the outlet of Lake Erie, but for many miles to the eastward, on both sides of the post-road. The lumps, when detached from their association with the calcareous carbonate, strike fire admirably with steel. They are very common. The specimens, however, which I have examined, are too brittle for gun-flints; and besides, when they break they do not assume the proper fracture and figure. But, as these remarks apply only to those which lie near the surface, the indications are strong enough to encourage a belief, that by a wider and deeper survey, the genuine fire-stone for musketry can be discovered. At any rate, it is important that they whose business it is to provide for the wants of an army, should have the Seneka fields and the Buffaloe plains in contemplation.

I have the firmest persuasion that a more intimate acquaint-

ance with the mineralogy of the land, will bring many more beds of silex to public notice.

Now, with so much knowledge, and with the sense of duty commanding an improvement of internal resources, the American people may rely upon themselves for this necessary article, and prove to the world, that they need not be dependent upon a foreign land even for a gun-flint.

Allow me to express the peculiar satisfaction I feel in communicating these things to you.

SAMUEL L. MITCHILL.

JAMES MEASE, M. D., &c. &c.

Washington, Jan. 20, 1813.

[The late George Clymer, Esq. of Philadelphia, informed the Editor last summer, that General Gates told him, *Mount Independence*, opposite Ticonderoga, abounded with flint.]

## ON SAFFLOWER.*

THIS plant, (*Carthamus, or Bastard Saffron,*) the flower of which is employed in dyeing and colouring, is cultivated in Spain and in many parts of the Levant,† from which it is chiefly imported.

This dyeing material contains two colouring matters, a yellow and red, the former of these alone is soluble in water and is comparatively of little value, the latter is soluble in alkalies and precipitated thence by several acids and forms a beautiful rose-red pigment. This is partly used for silk dyeing, but the great consumption of it is in the *rouge* so celebrated as a cosmetic, and of which it forms the essential ingredient.

To prepare the carthamus for this purpose it is necessary first to extract the yellow portion, which is done by tying the plant in

* From Aikin's Chemical Dictionary.

† Berthollet Elemens de la Teinture. Beckmann Comment. Gotting. vol. 8 and 4. Dufour. An. Chem. Tom. 48.

a linen bag, and then washing it incessantly with water, using much squeezing and rincing till the water passes off colourless. The residue in the linen bag now consists of the fibrous part of the plant and of the valued red fecula, which last however is in very small quantity. This is extracted by digesting the washed carthamus in a solution of carbonat of soda, (without applying artificial heat, which would impair the colour,) and this gives an orange yellow alkaline solution, which on saturation with acids turns red, and gradually deposits a beautiful red fecula, which is the pigment in question. Lemon juice is the acid preferred. But as the colour of this red fecula is extremely intense it will bear dilutions, which is done chiefly by rubbing it with finely powdered talc, in different proportions.*

Alcohol will also dissolve the red part of carthamus; and after the yellow portion has been extracted by water, a fine red tincture is made by digesting the residue in alcohol.

On account of the high price of carthamus it is seldom if ever employed except for giving a finishing gloss to dyed silks, and for the preparation of rouge. Alkalies of every kind immediately alter the colour to an orange yellow, again restorable by acids.

* The fineness of the talc, and the proportion of it mixed with the carthamus, occasion the difference between the cheaper and dearer kinds of rouge. —Imison's Elements Vol. 2. p. 433. *Editor.*

## DUTCH PROCESS FOR MAKING THE BLUE CALLED TURNSOL.*

LICHEN, Archil, or in case this cannot be obtained, the great moss of the oak is dried, cleaned, and pulverised in a mill resembling an oil mill, and then sifted through a brass wire sieve, the interstices of which do not exceed one millimetre in width (1-250th of an inch). The sifted powder is then thrown into a trough and mixed with an alkali called Vedas, which is nothing else but the cendres gravellies (pearl-ash) in powder. The proportion is one part by weight of the alkali, to two parts of the pulverised vegetable. This mixture is moistened with a small quantity of human urine: the urine of other animals does not contain a sufficient quantity of ammonia. The mixture ferments and is kept moist by successive additions of urine. As soon as the materials have become red, they are transferred into another trough, where they are again moistened with urine and stirred to renew the fermentation. Some days afterwards the paste acquires a blue colour, in which state it is carefully mixed with one-third of excellent pot-ash well powdered; and with this new mixture certain trays are filled, which are one metre (39½ inches) deep, and eight decimetres (31½ inches) wide. When the fermentation, which takes place for the third time, has given the paste a considerable deep blue colour, chalk or powdered marble is added, and the whole is well and perfectly mixed. This last addition is made, not to improve the quality of the blue, but to add to its weight. It is merely an affair of profit. The blue thus prepared is put into iron moulds 32 centimetres long and 22 square at the end (1¼ inch by $\frac{8}{16}$ of an inch). The moulded pieces are then placed upon deal planks in well aired lofts to dry: after which they are packed in casks for sale.

The Hollanders made a secret of this process: and in order to

* From the Journal du Commerce—Translated for Nicholson's Journal, vol. 2d, 4to.

mislead they have published that the blue was made with rags coloured by the plant turnsol: whence it has obtained its denomination.*

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## A New Table of the Quantities of Acid in Sulphuric Acid of different Densities, constructed for the Use of Manufacturers; being the result of experiments made with the strongest Sulphuric Acid of Commerce. The specific Gravities taken at the Temperature of 60°. By SAMUEL PARKES, *F. L. S.*

From Tilloch's Phil. Mag. Sept. 1812.

SIR,

HAVING been applied to by several persons in different parts of the kingdom, for instructions respecting a mode of ascertaining the quantity of acid in diluted sulphuric acid, I invariably referred them to Dr. Kirwan's Table, which was published in the year 1793, in the fourth volume of the Transactions of the Royal Irish Academy. This however always proved unsatisfactory, inasmuch as few manufacturers understood how to accomodate that table to the common oil of vitriol, or make it applicable to any practical purpose. This has arisen from the circumstance of Dr. Kirwan having taken sulphuric acid, as it exists in sulphate of potass, instead of the strongest oil of vitriol, for his standard of real acid. Having, in my own business, found the inconvenience of this, I several years ago formed a table for my private use, from the sulphuric acid of commerce, by diluting that acid with several successive portions of water; a table which I have ever since employed with great advantage. But as this table was formed at a temperature above the mean temperature of the atmosphere, and its range was too confined to be of use in every instance, I resolved to undertake the formation of a new one that would be more generally useful, and that should descend by regular gradation, down to the lowest point of dilution that

* English writers have used this denomination, but the dry salters, or dealers in drugs, distinguish these pestils by the name of litmus.

any consumer of sulphuric acid would be likely to require.* Having now, at no small expence of time and labour, completed this Table, I shall be obliged if you will have the goodness to insert it in the next Philosophical Magazine, as I conceive that it will be acceptable and useful to many individuals in various branches of trade and manufacture.

In making this table, I might have taken *purified* sulphuric acid, *i. e.* such as had undergone a second distillation; but as this is an article which is never employed but for philosophical purposes, I thought it better to make use of the common acid, and to take as good a sample of that kind as I could possibly procure. I have therefore chosen some of my own manufacture, made in the usual way, and concentrated, as is common in large manufactories, by steaming it in a boiler of lead, and finishing it in a retort of glass. When I began the experiment, the atmosphere of the room was at 60°†, and the acid was of the specific gravity of 1·8494, which, at this temperature, is as strong as it is ever sold.

In order to form the annexed Table, I proceeded as follows;

I first accurately weighed ten thousand grs. of this acid into a stoppered bottle of glass, and then added to it 100 grains of pure water.‡ When the mixture was become cool, after having been sufficiently agitated, the specific gravity of it was taken, and the result forms the first line of the Table. In this way I continued to dilute the acid with successive portions of water, taking care to let it rest a sufficient time between each addition of the water, that a complete union between the acid and the water might take

* The first line of the Table shows the specific gravity of a mixture of one part water and 100 parts of strong sulphuric acid. The latter, the specific gravity of one part of sulphuric acid mixed with 100 parts of water.

† For the difference which is occasioned in the specific gravity of sulphuric acid by change of temperature, consult Nicholson's Journal, quarto, vol. iii. page 211.

‡ In diluting sulphuric acid, it is usual, and safer, to add the acid by degrees to the water, and not the water to the acid; but with this very small quantity of water, such caution was not necessary.

place; having found by experiment that a mixture of sulphuric acid and water, even after it has become cold, requires several hours for it to arrive at the maximum of condensation. I took also the precaution of keeping it in stoppered bottles, that it might not imbibe water from the atmosphere, and frequently agitated it during each interval. And, in order to attain as great accuracy as possible, I procured a gravity bottle larger than usual, one that holds nearly ten ounces of water, and with a stem so small that at the part to which the fluid rises when properly filled, a single drop of the liquor will occasion a rise of nearly one sixteenth of an inch.

The balance which I made use of in these experiments, is so delicate that it will turn with the 20th part of a grain; and as the acids will erode the common scale-dishes, if dropt upon them, and endanger the accuracy of a result, I have long been in the habit of using those made with Wedgewood's ware, and such were employed in making this Table. Those parts of the Table which have a star opposite to them, were made by actual experiment—the intermediate ones were the results of calculation.

Since I concluded these experiments it occurred to me, that it might be useful to some manufacturers to know the quantity of acid per cent. in diluted acid of any given strength: I have therefore calculated the quantity in each, and annexed it. The column of *ounces* and *drachms* is added for the use of those who are accustomed to this mode of reckoning, and also for those who are not conversant with the usual method of stating specific gravities; and is calculated on the supposition of the wine pint holding exactly sixteen ounces avoirdupois of pure water.*

* It is a convenient way of measuring, to have a glass bottle with a narrow neck holding rather more than a pint of water, with a mark on the stem exactly at the place to which the water ascends when it contains exactly 16 ounces avoirdupois of that fluid. It was formerly understood that the standard wine pint was the exact measure of 16 ounces of pure water; but some experiments made in the year 1688, before the Lord Mayor and the Board of Excise, decided, that the sealed wine gallon of Guildhall contains only 224 cubic inches, though by the fifth of Queen Ann, chap. vii. § 7, it is called 231 inches. This decision makes the wine pint to hold only ·970 of an avoirdupois pound of wa-

The sulphuric acid which is consumed in these kingdoms amounts I believe to upwards of three thousand tons annually: the greater part of which is used in a state of dilution. For the purposes of dissolving iron or zinc, it should be diluted with at least five or six times its weight of water. Sulphuric acid is consumed in large quantities by bleachers, for making the oxymuriate of lime, and these people always use it in a state of dilution. The calico printers also expend large sums in the purchase of this acid, which they use in various states of dilution, for making what they call sours.

To these, and other manufacturers, this Table will be of use, not only in assisting them in the formation of acid of any given strength, but it will enable them at any time to ascertain whether their servants have observed due care in making the different preparations; which is a matter of great moment—for it often happens, that for want of this the printer and manufacturer suffer great loss, and the goods sustain an irreparable injury.

I need scarcely add that the oil of vitriol-makers themselves, may also derive great benefit from attending to this Table.

I am, sir, yours, &c.

SAMUEL PARKES.

Goswell-street Chemical Works,
London, Sept. 2, 1812.

ter; but as it is generally thought right, for all common purposes still to consider it of the capacity of 16 ounces avoirdupois, I have taken it at that in this instance.

A Table of the Specific Gravities of Sulphuric Acid, when diluted with different Portions of Water, at the Temperature 60°.

| | Drachms of Water. | Specific Gravity. | Weight of the Wine Pint. | | Acid per cent. |
|---|---|---|---|---|---|
| | | | Oz. | Drms. | |
| 100 Drachms Sulp. Acid. Sp. Grav. 1·8494, Or, 29 oz. 9 1-2 Drachms, the Weight, Avoirdupois, of the Wine Pint. | * 1 | 1·8484 | 29 | 9¼ | 99·009 |
| | * 2 | 1·8465 | 29 | 8¾ | 98·039 |
| | * 3 | 1·8445 | 29 | 8¼ | 97·087 |
| | * 4 | 1.8416 | 29 | 7½ | 96·153 |
| | * 5 | 1·8387 | 29 | 6¾ | 95·238 |
| | 6 | 1·8358 | 29 | 6 | 94·339 |
| | * 7 | 1·8319 | 29 | 5 | 93·457 |
| | 8 | 1·8270 | 29 | 3¾ | 92·509 |
| | 9 | 1·8222 | 29 | 2½ | 91·743 |
| | *10 | 1·8163 | 29 | 1 | 90·909 |
| | 11 | 1·8104 | 28 | 15½ | 90·090 |
| | 12 | 1·8046 | 28 | 14 | 89·285 |
| | 13 | 1·7988 | 28 | 12½ | 88·495 |
| | 14 | 1·7929 | 28 | 11 | 87·719 |
| | *15 | 1·7880 | 28 | 9¾ | 86·956 |
| | 16 | 1·7821 | 28 | 8 | 86·206 |
| | 17 | 1·7744 | 28 | 6¼ | 85·470 |
| | 18 | 1·7666 | 28 | 4¼ | 84·745 |
| | 19 | 1·7588 | 28 | 2¼ | 84·033 |
| | 20 | 1·7510 | 28 | 0¼ | 83·333 |
| | *21 | 1·7431 | 27 | 14¼ | 82·644 |
| | 22 | 1·7353 | 27 | 12¼ | 81·967 |
| | 23 | 1·7275 | 27 | 10¼ | 81·300 |
| | 24 | 1·7207 | 27 | 8½ | 80·645 |
| | 25 | 1·7138 | 27 | 6¾ | 80·000 |
| | 26 | 1·7070 | 27 | 5 | 79.365 |
| | *27 | 1·7002 | 27 | 3¼ | 78·740 |
| | 28 | 1·6933 | 27 | 1½ | 78·125 |
| | 29 | 1·6865 | 26 | 15¾ | 77·519 |
| | 30 | 1·6796 | 26 | 14 | 76·923 |
| | 31 | 1·6728 | 26 | 12¼ | 76.335 |
| | 32 | 1.6660 | 26 | 10½ | 75·757 |
| | *33 | 1·6582 | 26 | 8½ | 75·187 |
| | 34 | 1·6523 | 26 | 7 | 74·626 |
| | 35 | 1·6464 | 26 | 5½ | 74·074 |
| | 36 | 1·6406 | 26 | 4 | 73·529 |
| | 37 | 1·6348 | 26 | 2½ | 72·992 |

| | Drachms of Water. | Specific Gravity. | Weight of the Wine Pint. | | Acid per cent. |
|---|---|---|---|---|---|
| | | | Oz. | Drms. | |
| 100 Drachms Sulp. Acid. Sp. Grav. 1·8494, Or, 29 oz. 9 1-2 Drachms, the Weight, Avoirdupois, of the Wine Pint. | 38 | 1·6289 | 26 | 1 | 72·463 |
| | 39 | 1·6230 | 25 | 15½ | 71·942 |
| | *40 | 1·6171 | 25 | 14 | 71·428 |
| | 41 | 1·6113 | 25 | 12½ | 70·921 |
| | 42 | 1·6054 | 25 | 11 | 70·422 |
| | 43 | 1·5995 | 25 | 9½ | 69·930 |
| | 44 | 1·5937 | 25 | 8 | 69·444 |
| | *45 | 1·5879 | 25 | 6½ | 68·965 |
| | 46 | 1·5820 | 25 | 5 | 68·493 |
| | 47 | 1·5761 | 25 | 3½ | 68·027 |
| | 48 | 1·5703 | 25 | 2 | 67·567 |
| | 49 | 1·5645 | 25 | 0½ | 67·114 |
| | 50 | 1·5585 | 24 | 15 | 66·666 |
| | 51 | 1·5526 | 24 | 13½ | 66·225 |
| | 52 | 1.5478 | 24 | 12¼ | 65·789 |
| | 53 | 1·5429 | 24 | 11 | 65·359 |
| | *54 | 1·5390 | 24 | 10 | 64·935 |
| | 55 | 1·5351 | 24 | 9 | 64·516 |
| | 56 | 1·5312 | 24 | 8 | 64·102 |
| | 57 | 1·5273 | 24 | 7 | 63·694 |
| | 58 | 1·5234 | 24 | 6 | 63.291 |
| | 59 | 1·5195 | 24 | 5 | 62·893 |
| | 60 | 1·5156 | 24 | 4 | 62·500 |
| | 61 | 1·5117 | 24 | 3 | 62·111 |
| | *62 | 1·5078 | 24 | 2 | 61·728 |
| | 63 | 1·5039 | 24 | 1 | 61·349 |
| | 64 | 1·5000 | 24 | 0 | 60·975 |
| | 65 | 1·4960 | 23 | 15 | 60·606 |
| | 66 | 1·4921 | 23 | 14 | 60·240 |
| | 67 | 1·4882 | 23 | 13 | 59·880 |
| | 68 | 1·4843 | 23 | 12 | 59·523 |
| | 69 | 1·4804 | 23 | 11 | 59·171 |
| | *70 | 1·4765 | 23 | 10 | 58·823 |
| | 71 | 1·4726 | 23 | 9 | 58·481 |
| | 72 | 1·4687 | 23 | 8 | 58 139 |
| | 73 | 1·4648 | 23 | 7 | 57·803 |
| | 74 | 1·4609 | 23 | 6 | 57·471 |
| | 75 | 1·4570 | 23 | 5 | 57·142 |
| | 76 | 1·4531 | 23 | 4 | 56·818 |
| | 77 | 1·4502 | 23 | 3¼ | 56·497 |
| | *78 | 1·4473 | 23 | 2½ | 56·179 |

| | Drachms of Water. | Specific Gravity. | Weight of the Wine Pint. | | Acid per cent. |
|---|---|---|---|---|---|
| | | | Oz. | Drms. | |
| 100 Drachms Sulp. Acid. Sp. Grav. 1·8494, Or, 29 oz. 9 1-2 Drachms, the Weight, Avoirdupois, of the Wine Pint. | 79 | 1·4433 | 23 | 1½ | 55·865 |
| | 80 | 1·4395 | 23 | 0½ | 55·555 |
| | 81 | 1·4365 | 22 | 15¾ | 55·248 |
| | 82 | 1·4336 | 22 | 15 | 54·945 |
| | 83 | 1·4306 | 22 | 14¼ | 54·644 |
| | 84 | 1·4276 | 22 | 13¼ | 54·347 |
| | 85 | 1·4257 | 22 | 12¾ | 54·054 |
| | *86 | 1·4218 | 22 | 12 | 53·763 |
| | 87 | 1·4189 | 22 | 11¼ | 53·475 |
| | 88 | 1·4160 | 22 | 10½ | 53·191 |
| | 89 | 1·4130 | 22 | 9¾ | 52·910 |
| | 90 | 1·4101 | 22 | 9 | 52·631 |
| | 91 | 1·4072 | 22 | 8½ | 52·356 |
| | 92 | 1·4042 | 22 | 7½ | 52·083 |
| | 93 | 1·4013 | 22 | 6¾ | 51·813 |
| | *94 | 1·3984 | 22 | 6 | 51·546 |
| | 95 | 1·3955 | 22 | 5¼ | 51·282 |
| | 96 | 1·3926 | 22 | 4½ | 51·020 |
| | 97 | 1·3906 | 22 | 4 | 50·761 |
| | 98 | 1·3886 | 22 | 3½ | 50·505 |
| | 99 | 1·3867 | 22 | 3 | 50·256 |
| | *100 | 1·3848 | 22 | 2½ | 50·000 |
| | 105 | 1·3730 | 21 | 15½ | 48·780 |
| | *110 | 1·3632 | 21 | 13 | 47·619 |
| | 115 | 1·3535 | 21 | 10½ | 46·511 |
| | *120 | 1·3437 | 21 | 8 | 45·454 |
| | 125 | 1·3359 | 21 | 6 | 44·444 |
| | *130 | 1·3281 | 21 | 4 | 43·478 |
| | 135 | 1·3203 | 21 | 2 | 42·553 |
| | *140 | 1·3125 | 21 | 0 | 41·666 |
| | 145 | 1·3056 | 20 | 14¼ | 40·816 |
| | *150 | 1.2988 | 20 | 12½ | 40·000 |
| | 155 | 1·2919 | 20 | 10¾ | 39·215 |
| | *160 | 1·2851 | 20 | 9 | 38·461 |
| | 165 | 1·2783 | 20 | 7¼ | 37·735 |
| | 170 | 1·2724 | 20 | 5¾ | 37·037 |
| | 175 | 1·2676 | 20 | 4½ | 36·363 |
| | *180 | 1·2627 | 20 | 3¼ | 35·714 |
| | 185 | 1·2568 | 20 | 1¾ | 35·087 |
| | 190 | 1·2520 | 20 | 0¼ | 34·482 |
| | 195 | 1·2470 | 19 | 15½ | 33·898 |

| | Drachms of Water. | Specific Gravity. | Weight of the Wine Pint. | | Acid per cent. |
|---|---|---|---|---|---|
| | | | Oz. | Drms. | |
| 100 Drachms Sulp. Acid. Sp. Grav. 1·8494, Or, 29 oz. 9 1-2 Drachms, the Weight, Avoirdupois, of the Wine Pint. | *200 | 1·2421 | 19 | 14 | 33·333 |
| | 210 | 1·2343 | 19 | 12 | 32·258 |
| | *220 | 1·2265 | 19 | 10 | 31·250 |
| | 230 | 1·2187 | 19 | 8 | 30·303 |
| | *240 | 1·2129 | 19 | 6½ | 29·411 |
| | 250 | 1·2060 | 19 | 4¾ | 28·571 |
| | *260 | 1·1992 | 19 | 3 | 27·777 |
| | 270 | 1·1933 | 19 | 1½ | 27·027 |
| | *280 | 1·1875 | 19 | 0 | 26·315 |
| | 290 | 1·1825 | 18 | 14¾ | 25·641 |
| | *300 | 1·1776 | 18 | 13½ | 25·000 |
| | 310 | 1·1728 | 18 | 12¼ | 24·390 |
| | 320 | 1·1679 | 18 | 11 | 23·809 |
| | 330 | 1·1630 | 18 | 9¾ | 23·255 |
| | *340 | 1.1582 | 18 | 8½ | 22·727 |
| | 350 | 1·1552 | 18 | 7¾ | 22·222 |
| | 360 | 1·1523 | 18 | 7 | 21·739 |
| | 370 | 1·1494 | 18 | 6¼ | 21·276 |
| | *380 | 1·1464 | 18 | 5½ | 20·833 |
| | 390 | 1·1426 | 18 | 4¼ | 20·408 |
| | 400 | 1·1338 | 18 | 2¼ | 20·000 |
| | *420 | 1·1328 | 18 | 2 | 19·230 |
| | 440 | 1·1279 | 18 | 0¾ | 18·518 |
| | *460 | 1·1240 | 17 | 15¾ | 17·857 |
| | 480 | 1·1181 | 17 | 14¼ | 17·241 |
| | *500 | 1·1132 | 17 | 13 | 16·666 |
| | *550 | 1·1054 | 17 | 11 | 15·384 |
| | *600 | 1·0966 | 17 | 8¾ | 14·285 |
| | *650 | 1·0898 | 17 | 7 | 13·333 |
| | *700 | 1·0839 | 17 | 5½ | 12·500 |
| | *750 | 1·0781 | 17 | 4 | 11·764 |
| | *800 | 1·0732 | 17 | 2¾ | 11·111 |
| | *850 | 1·0693 | 17 | 1¾ | 10·526 |
| | *900 | 1·0664 | 17 | 1 | 10·000 |
| | *950 | 1·0625 | 17 | 0 | 9·523 |
| | *1000 | 1·0602 | 16 | 15½ | 9·090 |
| | *1100 | 1·0546 | 16 | 14 | 8·333 |
| | *1200 | 1·0507 | 16 | 13 | 7·692 |
| | *1300 | 1·0488 | 16 | 12½ | 7·142 |
| | *1400 | 1·0458 | 16 | 11¾ | 6·666 |
| | *1500 | 1·0429 | 16 | 11 | 6·250 |

| | Drachms of Water. | Specific Gravity. | Weight of the Wine Pint. | | Acid per cent. |
|---|---|---|---|---|---|
| | | | Oz. | Drms. | |
| 100 Drachms Sulp. Acid. Sp. Grav. 1·8494, Or, 29 oz. 9 1-2 Drachms, the Weight, Avoirdupois, of the Wine Pint. | 1600 | 1·0390 | 16 | 10 | 5·882 |
| | 1700 | 1·0370 | 16 | 9½ | 5·555 |
| | *1800 | 1·0351 | 16 | 9 | 5·263 |
| | 1900 | 1·0337 | 16 | 8⅝ | 5·000 |
| | *2000 | 1·0322 | 16 | 8¼ | 4·761 |
| | *2250 | 1·0283 | 16 | 7¼ | 4·255 |
| | *2500 | 1·0254 | 16 | 6½ | 3·846 |
| | *2750 | 1·0234 | 16 | 6 | 3·508 |
| | *3000 | 1·0214 | 16 | 5⅛ | 3·225 |
| | *3500 | 1·0185 | 16 | 4¾ | 2·777 |
| | *4000 | 1·0166 | 16 | 4¼ | 2·439 |
| | *4500 | 1·0146 | 16 | 3¾ | 2·173 |
| | *5000 | 1·0127 | 16 | 3¼ | 1·960 |
| | 5500 | 1·0117 | 16 | 3 | 1·785 |
| | *6000 | 1·0107 | 16 | 2⅞ | 1·639 |
| | 6500 | 1·0102 | 16 | 2⅝ | 1·515 |
| | *7000 | 1·0098 | 16 | 2½ | 1·408 |
| | 7500 | 1·0093 | 16 | 2⅜ | 1·315 |
| | *8000 | 1·0088 | 16 | 2¼ | 1·234 |
| | 8500 | 1·0083 | 16 | 2⅛ | 1·162 |
| | *9000 | 1·0078 | 16 | 2 | 1·098 |
| | 9500 | 1·0073 | 16 | 1⅞ | 1·041 |
| | *10000 | 1·0068 | 16 | 1¾ | 0·990 |

# PAPERS ON

# RURAL AND DOMESTIC ECONOMY.

## ON HANGING AND SECURING GRINDSTONES.

Specification of the Patent granted to JOHN SLATER, of Birmingham, in the County of Warwick, Coach-spring-maker; for an improvement in hanging and securing Grind-stones from breaking in the middle or centre.

Dated February 12, 1810.

FIRST, I cause each grindstone to be hung through its centre upon a spindle, in the customary manner, tight wedging excepted; and then I place on each side of the grindstone a flat piece of wood, or washer, or other substance of a soft or yielding nature, which must extend in a circle from the spindle hole in the grindstone to any degree or part of its diameter, as may be found most convenient, to form a bed, or equal bearing, against or upon the wood or washer so described. I place on each side of the grindstone a flat ring or rings, of iron or other metal, wrought or cast, about half an inch thick, more or less: and the diameter of the circle of each ring or rings must be about twenty-four inches more or less, as may be most conveniently adapted to the magnitude of the grindstone; and to which ring or rings I add a pair of strong gripes or bracing plates, with screws, made of iron or any other metal; each of which pair of gripes or bracing plates is to be a strong flat circular plate, and correspond in diameter with the ring or rings described above. And each griper or bracing plate must have a hole in its centre, of a proper size and figure to admit and receive the spindle of the grindstone. And also, as near as convenient to and round the circular outward edges of each griper or bracing plate, I cause holes to be made, at small distances, of a proper size and form to receive or admit screwed nuts or burrs fitted and screwed to them so as to hold and admit of strong screw pins or bolts, which must be made to screw pointedly, or in a direct manner, towards the before-described ring or rings and grindstone. The strong gripes or bracing plates, with

strong screws, may be made occasionally with or without the nuts or burrs, as their necessity depends upon the gripes or bracing plates being made of cast or wrought iron. The gripes or bracing plates being thus made, I then place them upon the rings, one on each side of the grindstone, the spindle of the said grindstone passing through them all, which are then to be secured completely tight and firm to their places, by cottets through, or screws fixed to, the spindle of the grindstone. On the outside of the whole griping or bracing apparatus I then firmly screw the screws or bolts in the gripes or bracing plates on or against the rings or washers, so as to press, gripe, or brace, and hold the grindstone between the apparatus on each and both its sides. And for the better elucidation of my said apparatus, I have caused drawings to be made in the margin of these presents.

In witness whereof, &c.

REFERENCE TO THE PLATE.—PLATE 1, FIG. 2.

A, a view of the grindstone and apparatus complete, as at work. B B, the flat piece of wood or washer for the bearing. C C, the two flat rings. D D, represents the strong gripes or bracing plates, with screws. E, the cotters, to secure and hold fast the apparatus to both sides the grindstone. F, the strong screws, pins or bolts in the gripes or bracing plates, to screw pointedly on and against the rings C C.

## METHODS OF PREVENTING DAMPNESS OF WALLS.

THE usual way is to work blocks of wood in the walls, as they are carrying up, and to nail battens to them for the purpose of lathing on; thus leaving an interval of two or three inches between the bricks or stone, and the inside of the laths. On the authority of an excellent builder in Philadelphia, this practice was formerly objected to, by reason of his having known instances of walls thus prepared, being thrown several inches out of plumb, in consequence of the expansion of the blocks; and in

the room of them, it was recommended to place battens from one and a half to two inches thick, at proper distances against the walls and the height of the room, securing them by stay nails driven between the joints, and to lay the laths upon those battens.* Another builder has, however, found no injury from the use of blocks, and therefore approves of the method; but those he used were made of the *heart* of *pitch pine*. If pitch pine cannot be procured, and blocks be used, they ought to be well seasoned, either by being kept in the shade, or by baking in an oven, in order to expel all moisture.

In case of a house being already built, as thousands are, even in damp and exposed situations, without either of the foregoing precautions, the following application may be tried, to keep out moisture. From an opinion of its merits, the Society of Arts in London, granted the inventor of it a premium of ten guineas in 1806:—

"Boil two quarts of tar, with two ounces of kitchen grease, for a quarter of an hour in an iron pot. Add some of this tar to a mixture of slaked lime, and powdered glass, which have passed through a flour sieve, and been completely dried over the fire in an iron pot, in the proportion of two parts of lime and one of glass, till the mixture becomes of the consistence of thin plaster. The cement must be used immediately after being mixed, and therefore it is proper not to mix more of it than will coat one square foot of wall, since it quickly becomes too hard for use, and care must be taken to prevent any moisture from mixing with the cement." For a wall merely damp, a coating one-eighth of an inch thick will be sufficient, but if the wall is wet, there must be a second coat. Plaster made of lime, hair, and plaster Paris, may afterwards be laid on as a cement. The cement above described will unite the parts of Portland stone or marble, so as to make them as durable as they were prior to a fracture.

* Dom. Ency. article House.

## TO TAKE STAINS OUT OF TANNED LEATHER.

From the Monthly Mag. London, vol. 22.

PUT half a pint of water in a bottle, and add one fourth of a pint of sulphuric or nitrous acid; afterwards add half an ounce of salts of lemon. When the heat caused by this mixture is subsided, add half a pint of skimmed milk; shake the whole occasionally for three or four days, and the liquor will be fit for use. To apply this mixture, cleanse the surface of the article, with a brush and soft water, next scrape on a little bath brick, or white free-sand, and add a little of the above liquor, and with a brush scower it well, repeating this process till the whole has been gone over: then with a clean sponge and water wash off what remains of the brick: leave the leather to dry gradually, and it will be of a light new colour. If it is wished to be darker, brush it with a hard brush a little before it is dry, and it will be of a rich brown tinge.

## ON SPONTANEOUS COMBUSTION.

SOME of the causes that lead to this serious accident have already been stated, and others referred to:* but as they cannot be too often laid before the public, particulary when they take place, from the operation of new causes, the following are here inserted.

The East India company's ship Earl Camden was set on fire in the following way, according to the report of the committee appointed to investigate the cause of the loss:

"From the evidence before us, it appears that the fire broke out on the larboard side of the gun room: that linseed oil and spirits of turpentine, were kept in the gun room, after that part of the ship had been stowed with cotton: that these combustible articles were deposited on the transoms and sills of the gun room ports; that the gunner and his mate were in the habit of repairing to them, to replenish their paint buckets, while they were en-

* Archives, vol. 3d, p. 167.

gaged in the task of painting the ship: that the light to guide them proceeded from a glass bulls-eye in each gun room port, and that the gunner always went and returned on the larboard side, on which the fire originated."

"From these facts we are led to the following inferences. First that oil had accidentally spilled in replenishing the paint buckets, and that with the inclination of the ship, it had run forward among the cotton. Secondly, that in conveying the replenished paint buckets along the larboard side of the gun room, paint had been accidentally spilled on the bales. Lastly, that the oil, absorbed by the gunny of the bales, produced the spontaneous ignition: and that upon the communication of the current of air, from the gun room scuttle, and the scuttles cut in the deck, it burst forth into irresistible conflagration."*

"A mercantile house at Hull, shipped in 1802, some bales of yarn packed in coarse linen wrappers; during the passage of the vessel to Gainsborough, a cask of linseed oil was staved and ran among the bales of yarn; being thus spoilt, it was returned to the merchants who sent it from Hull, it was unpacked, and the wrappers washed in soap and water and old urine three times, then returned to the warehouseman, who exposed those wrappers three days to dry. On the Saturday evening about six o'clock, he took them down, threw them loosely together, and placed them then not perfectly dry, immediately behind the warehouse door. Early the next morning, a smoke was discovered issuing from the door and windows of the warehouse, and on the door being opened, these wrappers were found in a flame, particularly round the outward edges as they lay, and the floor although of four inch plank, was nearly burnt through. There was no access to this place, except through the partner's house, and he locked and unlocked that entrance on the Saturday night and Sunday following:" the fire must therefore have been spontaneous. Part of one of the wrappers not consumed, smelt strongly of the linseed oil, and doubtless there was a portion remaining in the cloth after the washing.†

* Panorama, Vol. 5, London.

† Wonders of Nature, by Delafond, London 1803.

## A NEW AND EXPEDITIOUS MODE OF BUDDING.

By Thomas Andrew Knight, Esq. F. R. S.*

PARKINSON, in his Paradisus Londoniensis, which was published in 1629, has observed, that the nurserymen of his days had been so long in the practice of substituting one variety of fruit for another, that the habit of doing so was almost become hereditary amongst them: were we to judge from the modern practice, in some public nurseries, we might suspect the possessors of them to be the offspring of intermarriages between the descendants of those alluded to by Parkinson. He has, however, mentioned his "very good friend, Master John Tradescant," and "Master John Miller," as exceptions; and similar exceptions are, I believe, to be found in modern days. It must however be admitted, that, wherever the character of the leaf does not expose the errour of the grafter, as in the different varieties of the peach and nectarine, mistakes will sometimes occur; and therefore a mode of changing the variety, or of introducing a branch of another variety, with great expedition, may possibly be acceptable to many readers of the Horticultural Transactions.

The luxuriant shoots of peach and nectarine trees are generally barren; but the lateral shoots emitted, in the same season, by them, are often productive of fruit, particularly if treated in the manner recommended by me in the Horticultural Transactions of 1808. In the experiments I have there described, the bearing wood was afforded by the natural buds of the luxuriant shoots; but I thought it probable, that such might as readily be afforded by the inserted buds of another variety, under appropriate management. I therefore, as early in the month of June, of the year 1808, as the luxuriant shoots of my peach trees were grown sufficiently firm to permit the operation, inserted buds of other varieties into them, employing two distinct ligatures to hold the buds in their places. One ligature was first placed above the bud inserted; and upon the transverse section through the bark: the

* Transactions of the Hort. Soc., London, Vol. i. p. 194.

other, which had no further office than that of securing the bud, was applied in the usual way. As soon as the buds (which never fail under the preceding circumstances) had attached themselves, the ligatures last applied were taken off: but the others were suffered to remain. The passage of the sap upwards was in consequence much obstructed, and the inserted buds began to vegetate strongly in July: and when these had afforded shoots about four inches long, the remaining ligatures were taken off, to permit the excess of sap to pass on; and the young shoots were nailed to the wall. Being there properly exposed to light, their wood ripened well, and afforded blossoms in the succeeding spring: this would, I do not doubt, have afforded fruit; but that, leaving my residence at Elton, I removed my trees; and the whole of their blossoms; in the last spring, proved, in consequence, equally abortive.

## GOOSEBERRY WINE.

Communicated for the Archives of Useful Knowledge, by a Lady.*

DISSOLVE three pounds of white sugar in four quarts of water, boil it a quarter of an hour, skim it well, and let it stand till it is almost cold; then take four gallons of full ripe gooseberries, bruise them in a mortar, and put them into your vessel; then pour in the liquor; let it stand two days, stirring it every four hours; steep half an ounce of isinglass chipped fine in a quart of brandy two days; strain the wine through a flannel bag into a cask; then beat the isinglass and brandy in a mortar with the whites of five eggs; whisk them together half an hour†, put it in the wine, and beat them all together; close up the cask, and put clay over the cork; let it stand six months; then bottle it off for use; put in each bottle a small lump of sugar, and two jar raisins. This is a very rich wine, and when it has been kept in the bottles two or three years will drink like champagne.

* The same to whom the Editor is indebted for the recipe to make Orange Mamelade and French Ratifia, pp. 165—6.

† For this purpose clean birch rods, or corn broom may be used.

## ON THE ECONOMY DERIVED FROM INSURING PROPERTY FROM LOSS BY FIRE.

This advice is intended principally for people of slender circumstances and beginners on small means, with a view to prevent the necessity of future collections from the public to remunerate such losses.

THERE are several public offices in Philadelphia, where moveable or personal property of every description may be insured at so easy a rate as to be within the means of most people who possess any property, to avail themselves of the opportunity of being secure against loss by fire.

Say a mechanic possessing household furniture worth $300
Tools and materials used in the business, 200
——500

The charge for insuring this sum, for one year, if in a brick building, will be $1 50 cents.

1000 dollars value in furniture, tools, and materials, $3.

A widow keeping a boarding house or a small shop, and having furniture or goods worth $1000, may be secured for one year for $3.

A widow or single woman, being an under tenant, occupying one or more rooms with furniture worth 200 dollars, may be secured for 60 cents.

And so in proportion for larger or smaller sums.

Perpetual insurance may even be made at the "*American Insurance Office, Philadelphia,*" at the rate of $2\frac{1}{2}$ or 3 per cent. on the sum insured.

Are there any in town or country who possess health and a knowledge of any employment, that cannot, in the course of the year, spare as much as either of the sums here stated, to secure themselves against the calamity of fire? The premium for the insurance of a thousand dollars is only equal to one cent per day; and if any privation were necessary to produce such a saving, it would be amply compensated by the reflection, that it would place them above the necessity of looking for relief from public bounty.

If it should be said that there are widows and infirm people

that cannot spare the sum required, as a premium to secure that little property, in such a case it may be answered, let some one of their friends or relatives undertake to do it for them. A trifling sum advanced for such a purpose, would often turn out to be a greater act of friendship than ten times the sum to be given them in other ways.

Insurance from loss by fire produces many advantages; it often saves the party insured from ruin, without producing any inconvenience in remunerating: it exempts the mind in a great measure from that extreme agitation and fear which seizes it on every alarm of fire, and leaves it more tranquil to estimate the degree of real danger, thereby placing it in a better capacity to secure both life and property. The collections often made, prove the benevolence of the citizens generally; but the frequent calls made on them, may weary this disposition. If insurance were more in practice, the fund would not only be abundantly ample to make good all losses, but admit also of the present premiums being reduced. The door of security is open to all; if neglected, complaints ought not hereafter to be made. Was a public contribution to be attempted to remunerate an adventurer who had lost his little all at sea, it would probably be resisted under a general charge of neglect against the party in not having made insurance. Will not the same charge apply with equal force to those who chuse to take their own risk by land, when similar means of security are open to them?

The omission of insurance on personal property, in many instances, is probably more owing to ignorance of the opportunity there is to do it, than to a want of prudential consideration. To do away this obstacle it would seem adviseable for the officers to give every degree of publicity and facility to invite to it; and every individual who is acquainted with its advantages and the mode of effecting it, cannot do a more useful or friendly act than to advise all, within his sphere of intercourse to adopt it.

The advice to insure houses, applies with peculiar force to farmers, who in general neglect to provide for accidents by fire, and in consequence often suffer greatly: loosing in one night, the fruits of many years labour.

# PAPERS ON AGRICULTURE.

## COMPARATIVE EXPERIMENTS ON THE CULTURE AND APPLICATION OF KOHL RABI, DRUM-HEADED CABBAGE, AND SWEDISH TURNIPS.

Communicated by Mr. JOHN SADDINGTON, of Finchley*.

SIR,

BEING actuated by the most patriotic motives, I beg the favour of you to lay the following communication before the Society of Arts, together with the plants herewith sent. I will endeavour to give you an account, with as much brevity as is in my power to render myself intelligible, of the nature of the soil, the mode of cropping, and the produce thereof. The plot of land being about two acres and a half, and lying on a dead flat, I obtained leave in 1805 to underdrain and break up the same, the grass being sour and useless.

I cut two main drains, forty-two inches deep, gradually rising at top to twenty-eight inches, to give a sufficient fall, with sixteen branches, twenty-four inches deep, rising to sixteen inches, terminating at top like the letter Y: the drains were wooded with elm, and laid with my own hands; this work was done in February. The soil is a loam, with clay and gravel under. On the 20th of March I sowed three bushels and a half of oats per acre, which produced thirty-nine bushels per acre, weighing forty-one pounds per bushel. The straw was used, as it was threshed, for litter to stalled oxen. The 28th of September seeded with winter tares, four bushels of seed per acre. Ate them off in May with sheep. Two fallow ploughings were giving in June and August. About two hundred sheep were brought in at nights by way of fold. The 11th of October sowed three bushels of Thanet wheat per acre. Brined and limed in March, twice fed down with sheep. Produce, twenty-nine bushels per acre, weighing fifty-nine pounds per bushel, and very near three loads and a half of

* Trans. of the Society of Arts, vol. XXVII, p. 75.

straw per acre. The stubble was mowed and cleared off, and the land got ready for turnips. Three pounds of seed were sown the last week in August, when the plants were just making their appearance. Two quarters of gypsum were sown by hand to prevent the fly, which had the desired effect.

This proved a very valuable crop: having two hundred ewes which gave suck, it was a great acquisition to their milk. This induced me to try three experiments last spring with kohl rabi, or purple turnip cabbage, drum-headed cabbage, and Swedish turnips.

With due respect I beg to recommend to the Society kohl rabi, as a prolific and nutritious plant for the feed of sheep and neat cattle; and green food may be produced by this means from October until May. To ensure a succession of keep, seed should be sown in March, April, and May. The plant bulbs above the ground: the leaf is much like that of beet; it will stand in defiance to the severest frost; and as a proof thereof, I have cut with my knife several of the plants through the crown two inches deep, and they have stood three months afterwards in a sound state; some of them are here produced. The plants may be transplanted like those of cabbage; many of those transplanted at eighteen inches apart, I have found to weigh ten and eleven pounds a piece.—I must now beg leave to introduce my method of cultivation, with the average weight of the crop.

On the 14th of May, I sowed four ounces of seed broad-cast, and transplanted about forty-six poles therefrom, on the 18th of June, at twelve inches apart each way. The weight of a square pole is seven hundred and thirty-two pounds, taking each plant to average three pounds. The beauty and regularity of this crop in my idea overbalanced the trouble of transplanting.

I likewise sowed upon a bed in the garden, the second week in March, eight ounces of drum-headed cabbage. The fly and slug were very destructive to the plants. I transplanted them the second week in June, upon ridges thirty-six inches apart, the land being dunged at the rate of twelve loads per acre. Some of the cabbages weighed thirty pounds. I think the average about twelve pounds each, or twenty-five tons eighteen hundred sixty-

four pounds per acre. The caterpillar was very destructive. I have picked off in a morning as many as would fill a quart pot. Although the kohl rabi was planted near to the cabbage, I never saw a catterpillar upon any of the plants.

In the middle of June, I sowed the remainder of the field with Swedish turnips, but lost two thirds of this crop by the fly. One of the best of the Swedish turnips is here produced, in order to shew the great superiority of the kohl rabi, as there is not that waste in being eaten upon the ground, as it bulbs above, and the Swedish turnip in the ground. When the sheep have eaten the turnip level with the ground, and scooped out the inside, the remainder serves as a reservoir for the dirt and filth. The produce of this field has been sufficient for nine score of suckling ewes with rowen for five months. I sent to market, at Christmas last, house lambs fattened with milk only, which weighed eleven stone and one pound each, alive, at eleven weeks old. Should the Society consider these observations worthy of notice, I shall feel myself happy in hearing from you.

I am, Sir, very respectfully, your obedient servant,

JOHN SADDINGTON.

## ON THE CULTIVATION OF MADDER.

The paper by Mr. Arbuthnot, p. 279, on the cultivation of this important dyeing root, although very excellent, as being the result of a long and successful practice, yet only referred to its propagation by means of offsets from the roots. But the cultivation of the article in the United States, for some time to come, will be more rapidly extended by means of seeds, and for this reason the following account of the cultivation of the plant in the Levant is given.

### *Method of cultivating Madder in Greece.**

IN the Frank commerce, madder is designated under the name of *ali-zari*. The madder of the Levant is only a variety of

* From "A View of the Commerce of Greece," formed after an annual average from 1787 to 1797, by Felix Beaujour, ex-consul in Greece. Paris. Translated by Thomas Hartwell Horne. London, 1800. This is a very amusing and instructive work, and should be in the possession of every merchant.

the French, differing only in having a stalk more slender, leaves more smooth, and in having roots covered with a more tender parenchyme.

This plant grows indifferently in every soil; but it succeeds better in soils substantial and somewhat close, and which are seated on a clayey or sandy bottom. Humid marshy soils agree with it as well as with hemp. This is the reason why the best madder of Bœotia is that gathered on the borders of the lake Copaïs. *Capréna*, or Chœronea, *Scrivo*, or Orchomenus, the muddy Oncheste, and the principal villages on the plain of Thebes, have at this day as fine madder as that which grows on the banks of the Hermus, in the plain of Sardis.

When a person wishes to form a plantation of madder, he makes choice of a level soil, which is prepared as if it were destined for the reception of corn. We set shoots or plants that have proceeded from seed; but, in Greece, the practice of sowing in a nursery is unknown. The pure seed is thrown at random, and in furrows or on beds. The beds are separated from each other by paths or unoccupied borders, which divide the soil symmetrically, and present an agreeable prospect.

I ought to have mentioned, that the Levantines infuse their seed in horse-dung, before they commit it to the earth.

The madder is sown here in Pluviôse* and in Ventôse;† and, as soon as it arrives at the height of three or four feet, it has a bank of earth erected round its root. That operation consists in laying the stalk across the bed, and in covering it with earth, taken from the two lateral, or side paths, and is repeated every year, until the plant has shot forth new stalks: care is also taken every time to take the earth from the contiguous paths, which at length become trenches, while the beds become little banks.

The madder is not gathered here till the fourth or fifth year, which is the reason why the plant has time to enlarge itself, and be laden with fine and numerous roots, in which all the value of the madder consists.

* From January 20 to February 19.

† From February 19 to March 21.

The roots must be picked by hand, and carefully disengaged from the soil with which they are mixed. The practice of washing them, in order to cleanse them, is pernicious; because, the washing of them carries off part of the principal colouring substance.

As soon as the roots have been picked, they are deposited under shelter, and dried in the shade by the sole action of the air. The Greeks think that the rays of the sun would diminish the colouring substance; but this opinion is not probable, since we see, that the red colour of the madder, when applied on stuff, resists, without fading, the united action of the air and sun. Their practice has, in other respects, advantages, of which they have no suspicion. First, the colouring substance does not imbibe, in a free air, those fuliginous particles, which would tarnish it in a stove: secondly, the root diminishes, in drying, only six-sevenths, whereas, in a stove, it is reduced seven-eighths. These advantages are sufficiently real, without seeking any imaginary ones: they are also sufficiently great, and therefore the Greek practice ought to be adopted in all countries where the dryness of the air permits it.

The Levantines will never be persuaded to make use of fresh madder, which would give them an opportunity of saving half the roots, without diminishing their dying properties. But there are some cultivators, who reduce their madder, in drying, only five-sixths of its weight. That reduction is not sufficient: the root thus dried pounds badly, and clots together instead of being pounded. It is known to be sufficiently dry, when, on being rubbed in one's hands, it crumbles to pieces.

An arpent of land, sown with madder, yields, at the end of four years, four thousand okes of fresh roots; which, according to my circulation, must be reduced nearly to six hundred okes,* when they are dried.

* An oke is equal to 3lb. 2oz. English. From the produce of a patch raised by Mr. Salsbury of London, he calculates that an acre would yield fifteen hundred weight of the fresh root. This estimate is made upon the supposition that the seeds are sown in drills, one foot distant from each other. *Editor.*

In the commerce of Rotterdam, two species of madder are distinguished; that in *branches* and that in *clusters;* but, in the commerce of the Levant, all the aly-zari is sold in the *branch*, or, as it is called, in *sorte*. This last mode is subject to a thousand impositions."

The following directions to cultivate madder were given by a native of Smyrna, to Mr. *Jacob C. Otto*, who patriotically brought a quantity of madder seed to Philadelphia, in the year 1811.*

"Madder requires a soil rich and moist. The ground must be first well ploughed. The sowing season is from the middle of March to the middle of April. The first year its appearance resembles grass, and grows to about the height of one foot, and during the arid months of June and July, it dries up. The second year it grows to the height of two feet, and produces a flower, and seed like a pepper corn. In June and July, it dries up, and is cut and used as litter for cattle. The third year it grows three feet in height, and its leaves resemble those of the myrtle. It produces even at this age a flower and seed, and then dries up, and is also used for food and litter for cattle. The fourth year it grows but little higher than the third, and is thought to have attained its full height. After the plant has flowered, dried up and been cut, they take the roots from the earth in the months of July and August. People who are rich, leave them in the ground five, seven, and even ten years. And it is calculated that the root penetrates deeper into the earth every year, and becomes ten per cent. better in quality; the dye

* Mr. Otto put the greater part of the madder seed into the hands of the Editor, who distributed it among those who were most likely to attend to its cultivation. But he has been concerned to find, that none of it vegetated. This confirms the fact stated by Mr. Salisbury, (Trans. Soc. Arts, London, Vol. 25) that madder seed more than one year old will not grow, and it may serve as a guide to those who wish to follow the patriotic example of Mr. Otto, by attempting to send the seed of madder to the United States. It ought to be of the growth of the year in which it is exported, and directions should be given to have it sown immediately on its arrival, if that should not happen to be later than September in the middle states.

Roots should be sent also in earth to insure the introduction of the plant.

being better and stronger, the older the root is. If the root be left in the earth longer than ten years, it runs into wood, which deteriorates rather than improves the quality. When the root is taken from the earth, it must be left to dry about fifteen days in the sun, and freed from the earth adhering to it. The cleaner the root, the clearer and finer will be the dye. The seed of the first and second years is the best for sowing. If the ground be very moist, it is planted in rows, as is usual in Holland."

## ON THE CULTIVATION OF LIQUORICE ROOT.

From Martyn's edition of Millar's Gardener's Dictionary.

THERE are four species of *Glycyrrhiza*, viz. 1. the *G. echinata*, or Prickly-headed Liquorice. 2. *G. glabra*, or Common Liquorice. 3. *G. hirsuta*, or Hairy Liquorice. 4. *G. asperrima*, or Rough Liquorice.

It is the 2d species, or *G. glabra*, that is cultivated for its use in medicine. It is a native of the south of Europe, and of China. It has been cultivated since the time of Elizabeth, in England, and is at present largely grown about Pontefract, in Yorkshire. The leaves are composed of four or five pairs of ovate-leaflets, terminated by an odd one: these and the stalks are clammy, and of a dark green. The pods are short, containing two or three seeds. The roots run deep into the ground, and creep to a considerable distance, especially where they stand long unremoved.

It delights in a light sandy soil, which should be three feet deep at least; for the goodness of liquorice depends on the length of the roots: the ground should be well dug and manured the year before the roots are planted, that the dung may be perfectly rotted and mixed with the earth, otherwise it will be apt to stop the roots from running down; and before planting, the ground should be dug three spades deep and laid very light. The sets must be fresh plants taken from the sides or heads of the old roots, each having a good bud or eye, otherwise they are

subject to miscarry: these plants should be about ten inches long, and perfectly sound.

"The best season for planting them is in the beginning or middle of March, which must be done in the following manner, viz. First strain a line across the ground in which you would plant them, then with a long dibble made on purpose, put in the shoot, so that the whole plant may be set straight into the ground, with the head about an inch under the surface in a straight line, about a foot asunder, or more, in the rows, and two feet distance row from row; and after having finished the whole spot of ground, you may sow a thin crop of onions, which being plants that do not root deep into the ground, nor spread much above, will do the liquorice no damage the first year; for the liquorice will not shoot very high the first season, and the hoeing of the onions will also keep the ground clear from weeds; but in doing of this you must be careful not to cut off the top shoots of the liquorice plants when they appear above ground, which would greatly injure them; and also observe to cut up all the onions which grow near the heads of the liquorice: and after your onions are pulled up, you should carefully hoe and clean the ground from weeds; and in October, when the shoots of the liquorice are decayed,* you should spread a little very rotten dung upon the surface of the ground, which will prevent the weeds from growing during the winter, and the rain will wash the virtue of the dung into the ground, which will greatly improve the plants.

In the beginning of March following you should slightly dig the ground between the rows of liquorice, burying the remaining part of the dung; but in doing of this, you should be very careful not to cut the roots. The stirring of the ground will not only preserve it clean from weeds a long time, but also greatly strengthen the plants.

The distance which I have allowed for planting these plants, will, I doubt not, by some be thought too great, but in answer to that, I would only observe, that as the large size of the roots

* Another authority says, "the tops of the liquorice are cut every year."
*Editor.*

is the chief advantage to the planter, so the only method to obtain this, is by giving them room; and besides, this will give a greater liberty to stir and dress the ground, which is of great service to liquorice; and if the plantation designed were to be of an extraordinary bigness, I would advise the rows to be made at least three feet distant, whereby it will be easy to stir the ground with a breast plough, which will greatly lessen the expense of labour.

These plants should remain three years from the time of planting, when they will be fit to take up for use, which should not be done until the stalks are perfectly decayed; for when it is taken up too soon, it is subject to shrink greatly, and lose in weight.

## LIST OF TREES AND PLANTS, SUITABLE FOR CULTIVATION IN THE SOUTHERN UNITED STATES.

MADDER.—This was cultivated in South Carolina, previously to the American revolution to a considerable extent, owing, it is believed to the recommendation and example of the late Mr. Loocock, who wrote a pamphlet on the subject of the cultivation of the plant. Why attention was not paid to it, after the war cannot easily be ascertained. The cultivation of indigo, a crop never very profitable, and notoriously injurious to the health of the slaves, was resumed, and continued regularly until the ground ceased to produce it, or until the growth of cotton opened a new source of wealth to the desponding inland planter. After the peace of 1783, the demand for madder in the United States was steady, although not great; and all that was used for our domestic manufactures came from Holland. The price for some years before the embargo of 1807, averaged about 20 cents per lb., but in one year after the suspension of foreign intercourse between the United States and Amsterdam, it rose to one dollar per lb.; for some months past it has been steady at 50 cents; the reduction of the price been effected by the supply from the Mediterranean.

It is important to remark, that the madder of Smyrna has been

found far superior as a dye to the Dutch madder. This fact has recently been ascertained by the fair experiments of Mr. William Salisbury of the Botanic Garden of Sloane street, and Brompton near London, who states in the Transactions of the Soc. for the Encouragement of Arts, &c. vol. 25, p. 105, that he had extracts with the madder he raised, (the seeds of which had been sent from Smyrna) made in the same manner with the prepared Dutch madder of the shops, and found that the latter did not bear any comparison in point of colour with that of his own. An extract of the common madder, (rubia tinctorum) which had been some years growing in the garden at Brompton also proved inferior in colour to that raised from the Smyrna seeds. Both extracts were prepared in the same way, viz. by boiling the roots, and making a precipitate from them by alum, and vegetable alkali. Mr. Arbuthnot, (see Archives p. 283,) says too, that Turkey madder produces abundance of seed, which the common sort does not,* and that it puts out many vigorous and solid runners, whereas those of the common are hollow, and produce none of the best part of the madder.

Until the Smyrna madder shall be imported, the common madder at present in the United States may be cultivated.

During a time of scarcity of madder in England, and its consequent high price, the "London Society for the promotion of Arts, Manufactures, Commerce, and Agriculture," offered large premiums for the cultivation of the root; in consequence of which, and of the great demand for it by the manufacturers, the article was cultivated extensively. Mr. Arbuthnot† began it in the year 1765, and carried it to the extent of fifty acres, with great success and profit for some time.—Madder is a native plant of the South of Europe, the Levant, and Africa, but accomodates itself to the cold moist climate and soil of the province of Zealand, (where the Dutch madder is almost exclusively cultivated,) and to that of Great Britain. There can be no doubt

* Mr. M'Mahon, of Philadelphia, confirms the fact of the common madder producing but few seeds.

† For his paper on the subject, see the last No. of the Archives.

of the plant thriving well in every part of the United States, and few plants promise better than madder, owing to the rapid increase of our manufactures, even should there be no foreign market for the article, upon which, however, after peace, we may reasonably count. We may also expect that its quality will be increased from the climate and soil approaching so much nearer than either Zealand or England, to the native place of the plant.

It has also been found that if the madder root be employed fresh, it affords a finer colour than can be obtained from it after it has been dried, and also yields that colouring matter in greater quantity, nearly in the proportion of two to one. For home consumption, therefore, the expense and trouble of powdering the roots will be saved.*

*Olives, Capers, Figs.*—The following letter on the cultivation of these fruits, was addressed by Mr. Jefferson while minister of the United States at the Court of France, to the Agricultural Society of South Carolina, and published by them in 1788.

Paris, July 30, 1787.

"I was induced, in the course of my journey through the south of France, to pay very particular attention to the objects of their culture; because the resemblance of their climate to that of the southern parts of the United-States, authorizes us to presume we may adopt any of their articles of culture, which we would wish for. We should not wish for their wines, though they are good and abundant. The culture of the vine is not desirable in lands capable of producing any thing else. It is a species of gambling, and of desperate gambling too, wherein, whether you make much or nothing you are equally ruined. The middling crop alone is the saving point: and that the seasons seldom hit. Accordingly we see much wretchedness amidst this class of cultivators. Wine too is so cheap in these countries, that a labourer with us, employed in the culture of any other article, may exchange it for wine, more and better than he could raise himself.

* See head "Useful Arts" for directions to preserve and use fresh madder.

It is a resource for a country, the whole of whose good soil is otherwise employed, and which still has some barren spots, and a surplus of population to employ on them. There the vine is good, because it is something in the place of nothing. It may become a resource to us at a still earlier period, when the increase of population shall increase our productions beyond the demand for them, both at home and abroad. Instead of going on to make an useless surplus of them, we may employ our supernumerary hands on the vine. But that period is not yet arrived.*

The almond tree is also so precarious, that none can depend for subsistance on its produce, but persons of capital.

The caper, though a more tender plant, is more certain in its produce; because a mound of earth, of the size of a cucumber hill, thrown over the plant in the fall, protects it effectually against the cold of the winter. When the danger of frost is over in the spring, they uncover it, and begin its culture. There is a great deal of this in the neighbourhood of Toulon. The plants are set about eight feet apart, and yield one year with another about two pound of capers each, worth on the spot six-pence *sterling* the pound. They require little culture; and this may be performed either with the plough or hoe. The principle work is the gathering of the fruit, as it forms. Every plant must be picked every other day from the last of June till the middle of October. But this is the work of women and children. This plant does well in any kind of soil, which is dry; or even in walls, where there is no soil; and they last the life of a man. Toulon would be the proper port to apply for them. I must observe that the preceding details cannot be relied on with the fullest certainty;

* This reasoning applies very forcibly to the Atlantic States, but at the time the above excellent and patriotic letter was penned, the Western States except Kentucky, were not settled. In those states wine is now made to a profit, from European grapes, by two colonies of Swiss; and also at Harmony, near Pittsburgh by a settlement of Germans. *See Cumming's Tour.* Our native grapes would supply much better wine than what is transported from the seaports: and every industrious farmer might supply his own table with the article, at one-fourth the cost of imported wine, and yet not encroach upon the main business of the farm. *Editor.*

because in the canton, where this plant is cultivated, the inhabitants speak no written language, but a medley, which I could understand but very imperfectly.*

"The fig and the mulberry are so well known in America, that nothing need be said of them. Their culture too is by women and children, and therefore earnestly to be desired in countries, where there are slaves. In these the women and children are often employed in labours disproportioned to their sex and age. By presenting to their master objects of culture, easier and equally beneficial, all temptation to misemploy them would be removed, and the lot of this tender part of our species be much softened. By varying too the articles of culture, we multiply the chances of making something, and disarm the seasons, in a proportionable degree, of their calamitous effects.

"The olive tree is the least known in America, and yet the most worthy of being known. Of all the gifts of Heaven to man, it is next to the most precious, if it be not the most precious. Perhaps it may claim a preference even to bread; because there is such an infinitude of vegetables, which it renders a proper and comfortable nourishment. In passing the Alps at the Col de Tende, where they are mere masses of rock, wherever there happen to be a little soil, there are a number of olive trees, and a village supported by them. Take away these trees, and the same ground in corn would not support a single family. A pound of oil, which can be bought for 3*d.* or 4*d. sterling*, is equivalent to many pounds of flesh, by the quantity of vegetables it will prepare, and render fit and comfortable food. Without this tree the county of Provence, and territory of Genoa would not support one half, perhaps not one third, of their present inhabitants. The nature of the soil is of little consequence, if it be dry. The trees are planted from 15 to 20 feet apart, and when tolerably good will yield 15 or 20 pound of oil yearly, one with another.

* Until the true caper shall be imported, the common garden Nasturtium, *Tropeolum majus*, which by many are preferred to capers, might be cultivated. In the Philadelphia market great quantities are annually sold to excellent profit, for pickling. *Editor.*

There are trees, which yield much more. They begin to render good crops at 20 years old, and last 'till killed by cold, which happens at some time or other, even in their best positions in France: but they put out again from their roots. In Italy, I am told, they have trees 200 years old. They afford an easy, but constant employment through the year, and require so little nourishment, that, if the soil be fit for any other production, it may be cultivated among the olive-trees, without injuring them. The northern limits of this tree are the mountains of the Cevennes from about the meridian of Carcassonne to the Rhone; and from thence the Alps and Appenines as far as Genoa, I know, and how much farther I am not informed. The shelter of these mountains may be considered as equivalent to a degree and an half of latitude at least; because westward of the commencement of the Cevennes, there are no olive-trees in 43°½, or even 43°, of latitude; whereas we find them *now* on the Rhone at Pierrelatte in 44°½, and *formerly* they were at Tains, above the mouth of the Isere in 45°, sheltered by the near approach of the Cevennes and Alps, which only leave there a passage for the Rhone. Whether such a shelter exists, or not, in the states of South Carolina and Georgia, I know not. But this we may say, that either it exists, or that it is not necessary there—because we know that they produce the orange in open air; *and wherever the orange will stand at all, experience shews the olive will stand well, being a hardier tree.* Notwithstanding the great quantity of oil made in France, they have not enough for their own consumption, and therefore import from other countries. This is an article, the consumption of which will always keep pace with its production. Raise it, and it begets its own demand. Little is carried to America, because Europe has it not to spare, we therefore have not learnt the use of it: But cover the southern states with it, and every man will become a consumer of it, within whose reach it can be brought in point of price. If the memory of those persons is held in great respect in South Carolina, who introduced there the culture of rice, a plant which sows life and death with almost equal hand, what obligations would be due to him, who

should introduce the olive-tree, and set the example of its culture! Were the owners of slaves to view it only as the means of bettering their condition, how much would he better that by planting one of those trees for every slave he possessed! Having been myself an eye-witness to the blessings which this tree sheds on the poor, I never had my wishes so kindled for the introduction of any article of new culture into our own country. South Carolina and Georgia appear to me to be the states, wherein its success, in favourable positions at least, could not be doubted; and I flattered myself, it would come within the views of the society for agriculture to begin the experiments, which are to prove its practicability. Carcassonne is the place, from which the plants may be most certainly and cheaply obtained. They can be sent from thence by water to Bourdeaux, where they may be embarked on vessels bound for Charleston. There is too little intercourse between Charleston and Marseilles to propose this as the port of exportation. I offer my service to the society for the obtaining and forwarding any number of plants, which may be desired.

"Before I quit the subject of climates, and the plants adapted to them, I will add, as a matter of curiosity, and of some utility too, that my journey through the southern parts of France, and the territory of Genoa, but still more the crossing of the Alps, enabled me to form a scale of the tenderest plants, and to arrange them according to their different powers of resisting the cold. In passing the Alps at the Col de Tende, we cross three very high mountains successively. In ascending, we lose these plants one after another, as we rise, and find them again in the contrary order, as we descend on the other side; and this is repeated three times. Their order, proceeding from the tenderest to the hardiest, is as follows; caper, orange, palm, aloë, olive, pomegranate, walnut, fig, almond. But this must be understood of the plant only: for as to the fruit, the order is somewhat different. The caper, for example, is the tenderest plant; yet, being so easily protected, it is among the most certain in its fruit. The almond, the hardiest plant, loses its fruit the oftenest, on account of its

forwardness. The palm, hardier than the caper and orange, never produces perfect fruit here.

I have the honour to be, &c.

TH. JEFFERSON.

The foregoing observations were addressed to the Agricultural Society of South Carolina, at a time when rice and indigo, and which gave but poor returns, were the only great export staples of the country; for cotton was then but partially raised for coarse domestic manufactures. But although the necessity of new articles of culture was severely felt, and the letter of Mr. Jefferson was addressed to a society composed of some of the most enlightened men in the union, several of whom had travelled in the olive countries, and well knew the immense consumption of the article in the world, and even saw that their own climate agreed well with the tree,* yet neither the advice to commence the planting of them, nor the patriotic offer of Mr. J. to have the plants exported, were attended to. Had the cultivation of this invaluable tree been commenced shortly after the time above mentioned, they would now have been in full bearing, and might help to supply the place of cotton.† It is *not too late even now* to begin, for it requires but little foresight to predict, that after the cessation of the present war, the profit of cotton will be but small, owing to the increased growth of it in Louisiana, the Brazils, and the British settlements in Africa; and to the heavy duties which in France, and in all the countries subject thereto, have been laid on the article.

*Almonds.*—Almonds have ripened even as far north as Germantown, within seven miles of Philadelphia; and the following extract from a newspaper printed at Augusta in Georgia, August 1811, will show how great is the produce in that climate.

"On the plantation of Mr. Asaph Waterman, about ten miles from this place, there are several flourishing almond trees, which were planted by the late captain Kennedy. On the 27th July,

* There are several olive trees in Charleston, which bear well.

† Mr. Jefferson has since repeatedly urged the planting of the olive tree in South Carolina and Georgia, to gentlemen from those states.

were gathered from these trees 53 pounds of almonds, which at 25 cents per lb. would nett more than $4. to each tree. In 1810, the same trees produced about the same quantity. In 1809, the frost killed the fruit. The trees are seven or eight years old, appear thrifty, and not subject to decay, like peach trees."

As an article of export, 25 cents per lb. is too high; but the delicious nature of the fruit would for a long time cause a great part of the produce to be consumed near the place of its growth, and would doubtless pay well. Cotton or corn might even be planted in the same field with almond trees, which although a precarious fruit, as stated by Mr. Jefferson, yet might certainly be considered as worthy of attention, if even the fruit ripened once in two years. Cotton we know is sometimes cut off by frost, and has powerful enemies in rains, caterpillars, and the lady-cow bug, and yet the planters are not deterred from continuing its cultivation.

*Figs.*—Figs grow in the most luxuriant manner in South Carolina and Georgia, and might be multiplied to any extent. The kind at present cultivated, however, do not dry well, and turn sour after heavy rains, or heavy dews. There are many varieties of figs in Europe, which might be imported in order to find out that which would best suit the climate.

A Portuguese gentleman, Mr. Corea de Serra, informs the editor, that the WHITE FIG of Portugal and of the south of Spain, is the most juicy, and is esteemed the best for drying. Cuttings, properly put up, might be easily imported. A sandy dry soil, and a situation remote from moisture and fogs, are indispensably necessary for the successful cultivation of figs.

*Rhubarb.*—Several species of rhubarb have been accurately described. 1. The *Rheum Rhaponticum*, Rhapontic Rhubarb or Turkey Rhubarb. 2. *R. Undulatum*, Waved-leaved Rhubarb. 3. *R. Palmatum*, officinal or Russia Rhubarb. 4. *R. Compactum*, Thick-leaved Rhubarb. 5. *R. Ribes*, Warted-leaved Rhubarb. 6. *R. Tartaricum*, Tartarian Rhubarb. 7. *R. Hybridum*, Bastard Rhubarb.

1. The *Rheum Rhaponticum* is the species known in commerce

by the name of Turkey Rhubarb; and is cultivated by many persons in England, as well on account of the medicinal qualities of the roots, as the utility of the foot stalks of the leaves for tarts.* It has also been cultivated with great success by Mr. John Lang of Philadelphia, from seeds sent to him several times from the Botanic garden, Edinburgh. Other persons in the vicinity of Philadelphia, and in New Jersey, who procured plants from Mr. Lang, have cultivated it with equal success. In the dry light soil of Haddonfield, (New Jersey,) it thrives with uncommon luxuriance.

"It has a large thick root, which divides into many strong fleshy fangs, running deep in the ground: the outside is of a reddish brown colour, and the inside yellow, from which arise several leaves in number, according to the size of the root: they are smooth, of a roundish heart-shape, having very thick foot-stalks, of a reddish colour, which are a little channelled on their lower parts, but flat at their top. From between the leaves arises the flower stem, which is of a purple colour, garnished with one leaf at each joint. The stalks grow from two to three feet high, and are terminated by thick, close, obtuse spikes of white flowers, and are succeeded by large triangular brown seeds, having a border or wing at each angle."†

It may be propagated by seeds sown in the spring in beds, and transplanted in squares four feet each way. A *deep, loose, rich soil* is essentially requisite to a profitable culture. The head throws out also a number of offsets or young buds, by dividing which the plants may be greatly multiplied. In three years more, these new roots may be treated in like manner.

Mr. Lang has been in the practice, after taking up his rhubarb roots in the autumn for drying, and dividing the buds; to lay them on the ground in a moist situation, covering them well with leaves or tanner's waste bark; and in the spring he finds them fresh and ready for planting the moment the weather will permit.

* For this purpose the stalks and midribs are skinned, cut very small, and stewed with sugar. No water must be used.

† Martyn's edition of Millar's Gardener's Dictionary.

He also has found that the greater part of the plants do not produce seeds, and it often happens that the flowers on one side of the plant will perfect their seed, while those on the other never ripen. After the plant goes to seed, the principal root decays, and should therefore be taken up and dried, and the buds separated from the crown to form new plants.

When the roots are dug, they are to be well washed, the fibres taken away, and not the smallest particle of bark left on the roots: then cut into small pieces, and strung to dry on a pack-thread in the form of festoons so as not to entangle, in the warm air of a kitchen or store room,* till the superfluous moisture is exhaled, to prevent their becoming mouldy or musty. The parings will make excellent tinctures in spirit.

The *Rheum Palmatum* is a native of the mountains of Tartary, according to Bell, and is brought by the annual caravan to Petersburgh and Moscow. It also braves the cold of Russia, and thrives well in Scotland and England, into which countries the seeds were introduced by the late Dr. Mounsey from Russia, about the year 1762.† The cultivation of it has been attempted in the environs of Philadelphia, by Mr. Lang, from seeds imported from England, but without success. "The seeds," he says, "vegetate, and the young plants appear for some time healthy and vigorous, but whether owing to the great heat of the sun, the dryness of our summers, or the poverty of the soil, or to all those causes combined, it has so happened, that nine-tenths of the plants generally die before the end of summer."

*Opium.*—All Europe, and North and South America might be supplied with this important drug by the southern states. The opium poppy, which is the "white poppy," (papaver album),

* In the southern states a drying-house, open on all sides, would answer unless in a very rainy season.

† For an account of the experiments of those who cultivated rhubarb in England and Scotland, the reader is referred to the "Transactions of the Society Arts, London," for 1784, 1793,—4—5—6—7—8. Dr. Martyn, in his inestimable edition of Millar's Gardener's Dictionary, has arranged and condensed all the information extant on the subject.

grows well in every part of the United States, from New Hampshire to Georgia,* but it is in the three most southern states and in Louisiana, that the cultivation of the plant would be most likely to produce the greatest profit, in consequence of the number of children, and of old negro men and women, who might collect the opium, although not capable of paying for their support in any other way. From the experiments by various persons in making opium in the United States and England, all doubts as to the quality of the article being fully equal to that produced in India or the Levant, are dispelled.

The calamities of war, of which there does not seem to be any probability of a speedy cessation, will multiply the demand for this article an hundred fold; and as the poppy is an annual plant, it will of course be one of the first of those mentioned in this paper, to yield a return. The cultivation of the poppy even for the oil, which the seeds yield, would be extremely profitable, as it would supply the place of whale oil for lamps, and answer for numerous other purposes in domestic concerns, the arts, and in pharmacy.† The cake too, after the pressure of the oil, will be found, like the cake of flaxseed and the *sesamum* (or Benne) seeds, excellent food when used in moderation for fattening cattle; an object certainly of no small importance in most parts of the three southern states.

To the foregoing may be added, anniseed, senna of Alexandria, Jalap, and Ipecacuanha from the Brazils, Ginger, and Madeira nuts, absurdly called English walnuts; all these would prove highly worthy of attention. In order to procure the seeds and roots, it will be only necessary to make it an object for the enterprising traders of the northern and middle states to bring them

* See Archives, vol. 2, p. 279.

† In Archives, vol. 2, p. 177, a promise was made to give an abstract of the publications of Dr. Cogan, and Mr. Van Eys of Amsterdam, on the oil of poppy: but on reflection this has not appeared necessary, as the Editor is informed the oil has by no means a pleasant taste, although quite innoxious: and as no want of oil for the table need exist, considering that the Benne or *sesamum* plant grows luxuriantly in the southern states.

over; and all of them may be introduced without difficulty, and speedily.

Finally, the numerous vegetables possessing valuable dyeing properties, and with which the southern states abound, might be profitably cultivated, and would be acceptable presents to the manufacturers of the northern states. To particularize them would be unnecessary, as they are enumerated in Dr. Ramsay's History of South Carolina.

## ON THE CULTIVATION OF THE FULLER'S TEAZLE—DIPSACUS FULLONUM.

IT is propagated by sowing the seeds in March, upon a soil that has been well ploughed: about one peck of seed will sow an acre. When the plants are up, they must be hoed, and then singled out to about six or eight inches distance; and as they advance, and the weeds begin to grow again, they must be again hoed, cutting out the plants so as to let them stand a foot asunder. The first appearance of teazle is much like that of lettuce. The second year the plants will shoot up stalks with heads, which will be fit to cut in august (in England) and when ripe they turn brown. The stalk is a foot long. When cut, they are to be tied in bunches of 25, setting them in the sun: but if the weather be not fair, they must be set in rooms to dry. The common produce is about one hundred and sixty bundles or staves upon an acre. Old pasture lands, the soil of which is a strong clayey loam, is best adapted to the culture of teazle.

The above directions are collected from the edition of Miller's Gardener's Dictionary, by professor Martyn of Cambridge.

The Editor was informed by a person acquainted with the cultivation of teazle, that the heads should be pulled before they are quite ripe, and the top branch pinched off to force out lateral burrs. The practice of topping the cotton plants once or twice to increase the blossoms, would lead to a supposition, that the same practice might be advantageously adapted with the teazle.

## CALCULATION OF THE GROUND GONE OVER IN PLOUGHING AN ACRE OF LAND.

From Dickson's Agricultural Magazine. London, 1808.

AN acre of land (vide *Hutton's Arithmetic*, page 18) contains four thousand, eight hundred, and forty square yards; which being cut into four parts, namely, by slices of nine inches each, would give nineteen thousand, three hundred, and sixty yards. Now, there being one thousand, seven hundred, and sixty yards in a mile, (*Hutton*, page 17); if we use the latter number as the divisor, and the former as the dividend, the quotient will, *I believe*, amount to exactly eleven miles, thus:

4840 square yards in an acre.
Multiply by 4 slices in the breadth of each yard.

1760)19360(11 miles.
1760

1760
1760

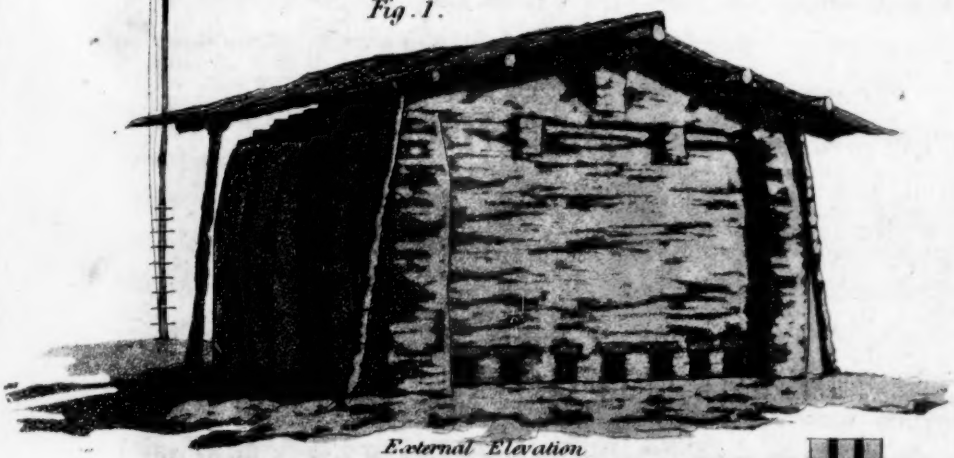
Here we have no less than eleven miles, without considering the turns at the headlands; if we add them the following augmentation of measure will arise from the most moderate calculation.

Let us take the average *stretch*, or length of furrow, at two hundred yards, which in nineteen thousand, three hundred, and sixty yards, will give nearly ninety-seven furrows in every acre. Now, the half breadth of each ridge, being taken at two yards, and allowing the plough to shoot two more beyond where it works, and as much to go back again, say six yards in all, at each headland, that multiplied by ninety-seven, will give five hundred and eighty-two, or about the third of a mile, merely for the ground which the *plough itself* goes over.

If we consider the great sweeps which long teams, and bad drivers, make at the ends of the land, we should begin upon an endless computation! I have supposed twelve feet ridges, and taken half that breadth as the overlap at every *bout*.

Fig. 4.

Fig. 1.



External Elevation

Position of Bricks in the Kiln above the arches

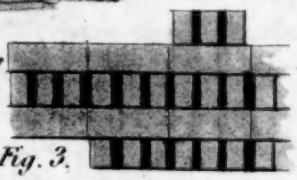
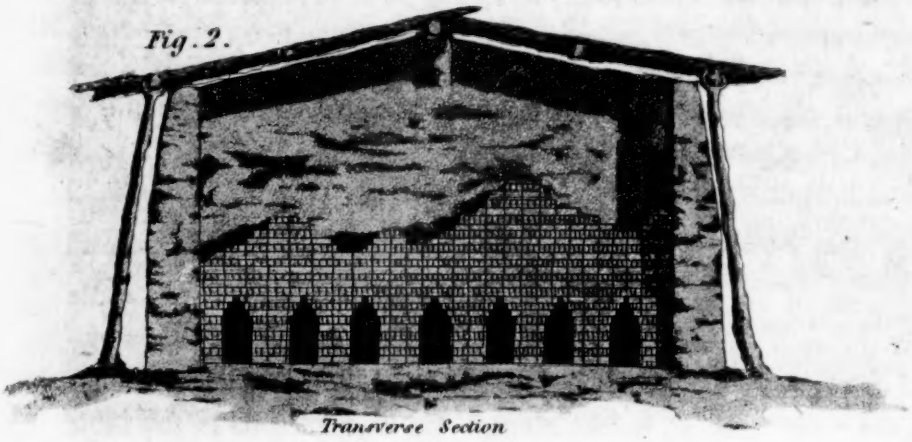


Fig. 3.

Fig. 2.



Transverse Section

# PAPERS ON THE USEFUL ARTS.

## METHOD OF MAKING BRICKS AS FOLLOWED IN PHILADELPHIA.

With a plate of a brick kiln.

THE clay is invariably dug in the autumn, and during the winter. It is dug in spits, each spit being one foot deep, four feet wide, and 16 feet long, which makes a mass for one thousand bricks, and is thrown aside into a loose heap, until the weather will allow it to be worked in the spring. It is then cut, slashed, and worked with a spade into heaps of about six feet by ten feet in compass, a mass sufficient to make 2,000 brick; water is then thrown upon it, (the quantity of which is different in different clays), and permitted to remain for twenty-four hours, when it is tempered, and skirted all round, patted together, and sprinkled lightly with water, smoothed neatly over with a spade, keeping the mass tight and compact, and finally covered with boards, cloths, or bushes, to prevent the injurious effects of the sun and air. It is then ready for the moulder. At day dawn, the wheeler, with his barrow running on a platform or barrow way, comes to the prepared mass, and loading his barrow, carries it to the table of the moulder, putting it on with a spade tight and compact: the moulder then takes the brick mould with his left hand, and a handful of dust in his right, from a tub placed at his left side, and sprinkles or rubs it over the table; he then cuts down with his two hands finger end to finger end, enough of the clay to make a brick and a half; this is called a *walk*; then forming the mass into a shape somewhat of the mould, by first drawing it towards him, then pushing it from him, and again drawing it towards him, he forces the clay into the mould, so as to fill the corners, and strikes off the superfluous clay with an instrument called a plane; which is a steel plate about one-eighth or one-tenth of an inch thick, 8 inches long, 5 wide, with a handle near the end. When the mould is filled, the bearer takes it away and delivers the clay therefrom in regular order on the floor, making 44 rows, each 53 bricks along. He then returns to the table

for another, and in coming back, he scrapes out one end and a side of the mould: the next time he reverses the mould, and cleans the other end and other side: the scraper is made of hickory,* and is attached to his right side by a string, but not hanging lower than the knee, otherwise it will drag on the next row when he stoops to lay down the bricks.† Immediately after the rows are finished, the bricks are turned upon their edges, and if a welt is found upon the under side, it is removed by rubbing the *flat* of the hand over it. For very nice brick a knife is used to remove the welt. After ten or fifteen minutes they are removed to a board shed 21 feet long, where they are *hacked*, that is piled up on edge, so that one brick is made to stand with a small angle on two others: the further end standing on two, and the nearer end on one. This part of the business is divided among the gang, each one turning and hacking 500 brick, and taking care to leave the breadth of the middle finger between each brick. The courses amount to 16 or 20, but for beginners 17 will be enough. The courses are reversed, to favour the free passage of the air through them. It is highly requisite that the bricks forming the first ten courses should be well dried, otherwise they will be crushed by the weight of those above them. The bricks remain in the shed until the kiln is ready, and care is taken to keep out all moisture. When ready, the bricks are carried by one or two gangs, to the kiln; the boys loading the barrows, the wheeler and temperer wheeling all and tossing them to the moulder, who sets them in the kiln. The setting of the bricks is an important part of the business, which cannot be perfectly understood without an actual inspection of the work. The following is an outline of the process.

The object is so to place the bricks as to permit the free passage of the fire through them; and for this purpose the moulder beginning at the back of the kiln, runs up seven straight courses forming a part of the facing of the arch, setting the bricks on edge. To insure the accurate arrangement of these courses, a straight

* See plate 2d figure 4.

† The cleaning only half the mould at a time, is found to favour the delivery of the brick from it.

edged board called a ruler about four inches wide, is run in from the external holes, and reaches across the kiln: this board is placed an inch and a half back from the sides of the kiln holes, and against the edge of this board the bottom course is set.* The bricks in the third and seventh courses are set tight, or close; but those in the other courses are set a finger breadth from one another. This vacancy is essential.

The setter then begins to overspan, that is to form the arch, by placing the bricks so, that every course of bricks may extend one inch and a half,† beyond the course immediately below it, for five coures in height, taking care to *skintle* well behind, that is to back up or fill up with brick against the overspanners.

The next seven courses on the opposite side of the arch being then set as before; the setter again begins to overspan five courses to meet the overspanning on the opposite sides, thus forming the arch. This is called the rounding, and is a nice and important operation. The two first courses may be set with safety, but of the last three which close the arch, ten bricks only must be set at a time, *one on two* to meet the top courses of the overspannings: if more are set, the overspanners not being supported on the back will cause the arch to fall in. The middle brick is then run up as soon as possible as high as the rounding, viz. 14 courses, the setter taking care to have the heads of the middle brick tight against the ends of the roundings. When the setter has so far proceeded, he sets four bricks end against end, (technically four nine inches) and then proceeds to set the kiln to the intended height, by the rule of three bricks upon three (see plate 2d. fig. 3.) reversing each course, keeping the heads of the bricks tight against each other. Care must be taken, not to set his intended height without the middle brick being up against the

* When the bottom course is set, the board is commonly removed, but it is better to leave it in, to prevent the rising of the dust, which will settle on the lower courses of bricks and cause them to burn unequally.

† Should the inch and a half in overspanning this rounding not meet the top course of the facing, more space may be taken.

rounding. Thus the setter proceeds until the kiln is full; observing to make each hole alike.

The top course is covered with bricks placed flat and so disposed that one brick covers part of three others. This process is called platting.

The kiln being full of bricks, wood is put in the kiln holes, and set on fire in order to dry the bricks gradually and equally. The wood is put on an iron bar placed across the kiln holes and raised about three inches from the ground, to increase the current of air. In about three days and three nights, the top of the kiln must be examined, in order to see whether the *fire is up*, that is, whether it has reached the top of the kiln; if so, the smoke (called water smoke,) will change from a light to a black hue: the roof is then taken off, the fire is pushed, and a strong regular red heat attentively kept up for from 48 to 60 hours more; care must be taken not to choak the holes, or the draught will be prevented, the bottom course will be partially burnt, and the fire will not work through. The heat must not be so strong as to be white, for the bricks will then melt or drop. At the end of the time just mentioned, the kiln will be found to have sunk about 9 inches: but the shrinkage depends on the nature of the clay,* and after one or two burnings the sinking of the kiln will pretty accurately determine when the bricks are sufficiently burnt. Satisfaction having been obtained on this point, all the holes must be closed up with brick, and daubed over with wet sandy loam, so as carefully to exclude the air, for four or five days; at the end of which the *pistoing* is to be opened, the *platting* piled on the walls, and the bricks regularly taken down. From 50 to 60 cords of wood are consumed at the burning of 140,000 brick. Split wood is used inside of the kiln, but that under the wall may be round.

There are seven kiln holes in each end; all two feet high, and 16 inches wide, with fire-stone heads outside. The inner stone of the kiln hole, is laid one foot higher than the outside stone, in or-

* The stronger the clay, the more it shrinks. In general, 35 courses will shrink 9 inches.

der to give the kiln a draught, and not to confine the wood under the wall. The distance between each kiln hole is the length of three bricks and two inches. The height of the kiln is commonly 13 feet, giving room for 35 or 36 courses.* The average width in the clear is 28 feet, and each kiln contains about 140,000 bricks. The bottom of the kiln must be level. In Philadelphia, they are paved with brick having the flat side down. The mouth of the kiln, (called the pistoing) is ten feet wide: see A. plate 2 fig. 2d—when the kiln is full, this is closed with a wall commonly of nine inches of brick, set on edge, the whole height of the work, and daubed with a sandy loam mixed with water, as tight as possible: but it is better to build the wall three bricks and a half thick from top to bottom, in order to diminish the risque of its cracking, and to retain the heat. In walls of such a thickness, two stout props should be placed at each corner of the kiln, at the distance of a brick and a half from the corner of the side walls. The side props ought not be so thick; but they must not bend, when the pressure arising from the expansion of the kiln forces them out. The external cover of the kiln consists of boards, and is supported by props.

## ON PRESERVING MADDER ROOTS, AND ON DYEING WITH FRESH ROOTS.

From D'Ambourney's Experiments on Dyeing.

THE planter may preserve, in cases of necessity, his crop for a whole year in a trench, observing only to lay an alternate bed of roots and a little earth. In this manner he may wait for a proper opportunity of selling them. When about to be used, they must be washed clean of the earth adhering to them, and for every pound of dried madder used, there must be four of the green root.† The roots are to be choped moderately small, and

* In a first experiment there ought not to be so many courses.

† This difference appears very great: the dyer will of course make cautious experiments on the relative proportions between dried and fresh madder. *Editor.*

afterwards bruised in stone or wooden mortars, *(by no means in iron,)* till they are reduced to a sort of pulp. This pulp must be put into the boiler, when the water, to which no addition must be afterwards made, is somewhat more than lukewarm. It is then left till it be so hot as scarcely to bear the hand in it. The stuff or cotton is then to be plunged in, and kept moving for three quarters of an hour, the bath being simmering all the time. Lastly it is made to boil for three quarter of an hour.

## NICHOLS'S PATENT PRESS.

THIS powerful combination and application of the lever, was made by Israel Nichols of the county of Otsego, New York, and was originally designed for the use of clothiers, and for pressing cyder. The following certificate proves its powers.

State of New-York, Otsego county, ss.

By the request of Israel Nichols, of the town of Burlington, in said county, we whose names are hereunto annexed, met at the Clothier's Works of *Martin Lee*, and *Abner Fitch*, in Burlington, on the 13th day of January, 1812, and saw the operation of one of the above named I. Nichols's Patent Clothier's Presses, which operated with two rollers and two levers; (the length of the first is five feet) which performed in the following manner: two blocks, were prepared of good white oak, between which were layed twenty-three dollars, one on top of the other, which were forced into the solid blocks, till the blocks met together, with the strength of one man, with one hand; and by adding a rope to the first lever, which went round the second roller, to which roller was added the second lever, of five feet nine inches, on the end of which was hung two pounds and eleven ounces weight, it pressed still harder, till the weight came to the floor; and we saw the press beam when down in full force raised up to its full height and brought down again to its full force, to perform as above mentioned, in less than one minute, by one man only. Signed by Martin Lee, Abner Fitch, and eleven others.

END OF VOL. III.

# INDEX.

PLATES.



CUTS.



ERRATA IN VOL. III.

Page 175, line 18, for "*case*," read cave.
203, line 14, in some copies, for "*limbers*," read timbers.
——, line 7 from bottom, in some copies, for "*timbers*," read limbers.
272, dele "*Mr.*"
305, note, for "*Mag.*" read Jonrnal.
401, line 1, for "*ovem*," read over.